Sept. 1928

Electrical Manufacturing

Vol. 2 A Gage Publication No. 3

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The above illustration shows die cast plunger cylinder and cover used in Smith Pneumatic Clutch Control. All threads and holes are cast in. Dimensions are held within finish tolerances.

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RATHER than build factories and buy expensive equipment, young industries turn to die casting to help them to success. Thus capital which might otherwise be tied up in fixed assets is available for sales promotion.

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Problems of die construction and die costs are simply presented in this non-technical booklet. Send for your copy.

Whether yours is a young business or an old business undertaking the manufacture of a new product, a study of your production problems by Milwaukee Die Casting Engineers may mean the difference between failure and success.

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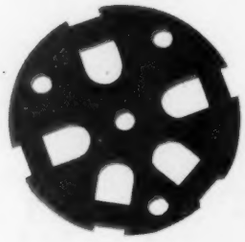

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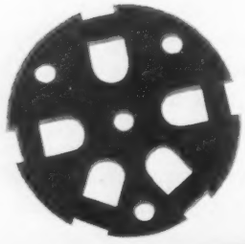

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Electrical Manufacturing

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Farm Market Keeps Growing

ELECTRICAL manufacturers, who are looking thoughtfully toward the farm market, should aim to keep in touch with the Committee on the Relation of Electricity to Agriculture. This organization focuses the activities of various government departments and national organizations which are promoting the use of electrical service on the farm. Its headquarters are located at 1120 Garland Building, Chicago. E. A. White is director of the Committee.

In summarizing the progress that has been made in developing rural electrical service, Dr. White has written to the editor, as follows:

"It is estimated that the number of farms now receiving electric light and power service from central stations is rapidly approaching the 500,000 mark. It is significant that on January 1, 1928, 160 electric light and power companies, either through rural electric service departments or otherwise, were organized to give this matter attention, and that these companies had in their employ 403 men who were giving part or full time to rural electrification work. In some companies today we find from 12 to 20 men devoting all or virtually all of their time to this work. There is enough data available to show that in some sections loads of 12,000 kw.-hrs. a year per farm can be developed. The idea that the farmer can and will have electric service is now sufficiently established to insure this phase of the business continuity. The only questions now appear to be, 'How rapidly and to what extent it will grow?'"

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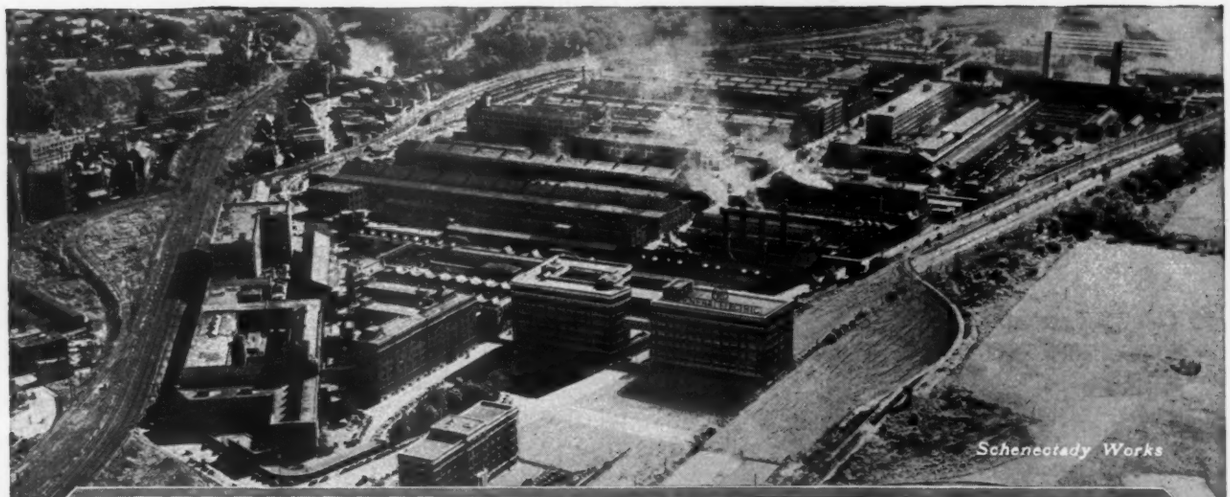

In these mighty workshops of General Electric, millions of pieces of Textolite molded have been produced. And production to-day is greater than ever before.

Here is a supply available for decades; a responsible, comprehensive organization; a reliable source of highest-grade materials.

These plants are backed by the great resources of General Electric; by the famed research laboratories; and by unexcelled facilities for service.

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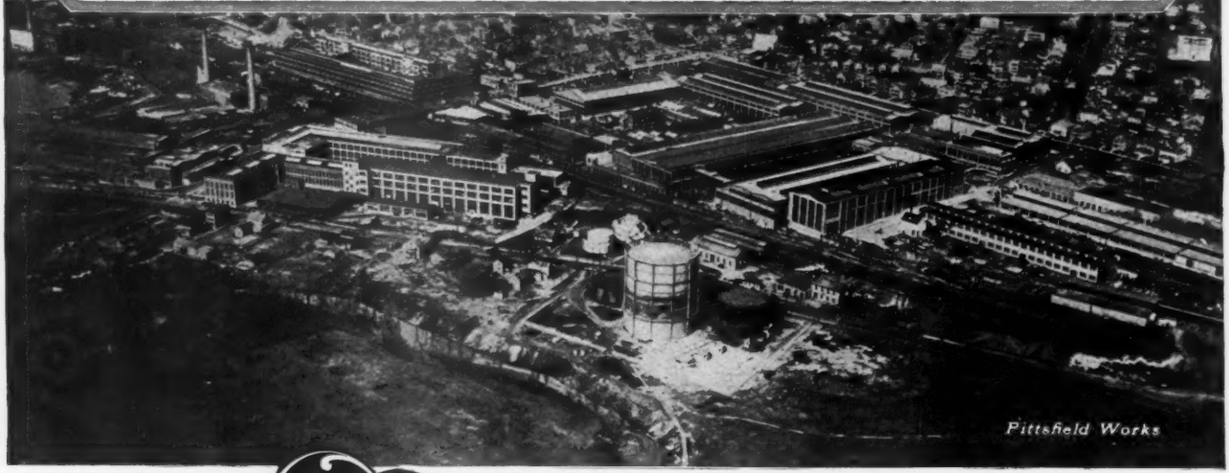

GE Textolite Molded

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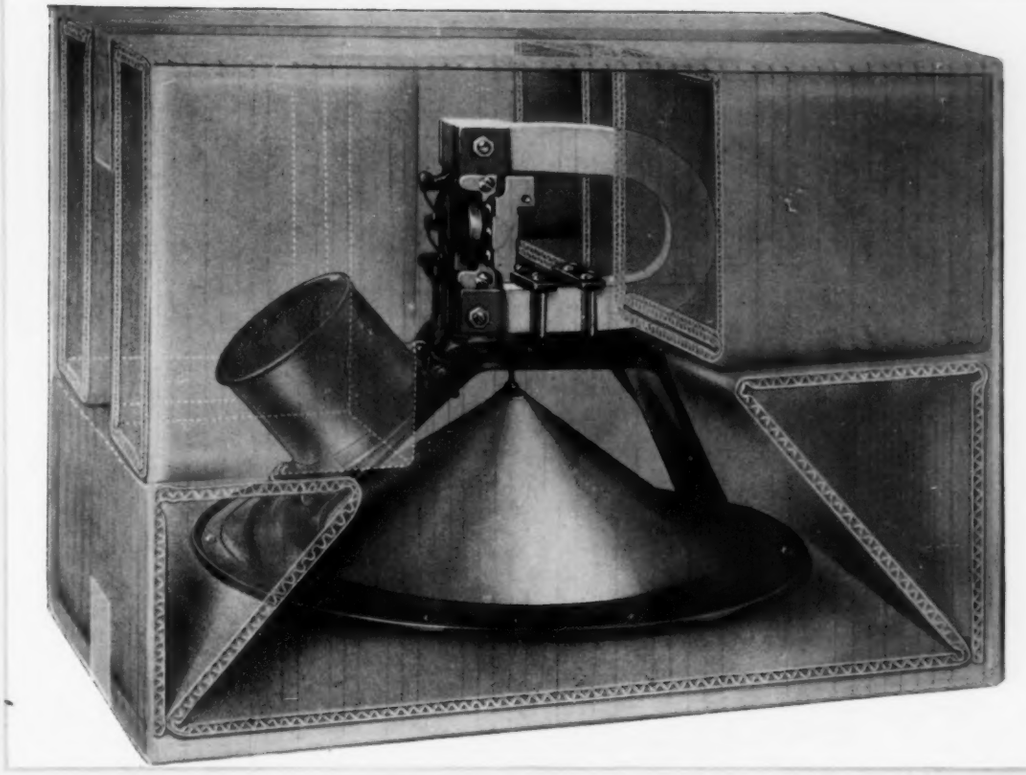
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

GAIR
CORRUGATED CASES



THIS is a phantom picture of a Corrugated Shipping Case so equipped with stabilizing cells and restraining stalls that the sensitive and fragile loud speaker packed within retains its poise no matter on what side or end the Case is pitched. The article is virtually suspended and safe from vibratory shock.

Packing problems of this sort are interesting. It is hard to safely pack and maintain the equilibrium of articles of uncentered weight, but as yet we have had no reasonable problem that we have not solved. In the instance of the illustrated Corrugated Case, Engineer Malcomson says: "We threw the Case all over the Laboratory to bring to light its weakest point. Then, building a new design to protect this, we went through the same process with each successive Case until we achieved a perfect carrier with the heavy magnet firmly locked."

In this practical way, Gair Engineers diagnose Corrugated Case weaknesses and by scientific methods correct them. This interesting Laboratory service, is available to you. There is also a clinic for improving the efficiency of badly developed Corrugated Cases and such as fail your requirements.

ROBERT GAIR COMPANY

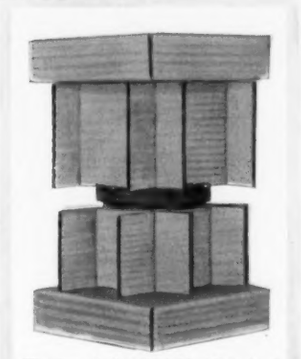
420 LEXINGTON AVENUE, NEW YORK

GAIR PROTECTIVE PACKING

Artificers in the Gair Laboratory have a genius for contriving safe carriers for frail merchandise.

Glass spiral on slender stems imbedded in a solid base.

The base is trapped immovably in a cell.



The glass spiral rigidly held within a hood.

ASIDE from the specially contrived Corrugated Containers for products of great susceptibility to breakage, the enormous "Tonnage" output of Robert Gair Company's Plant goes to packers of standard canned goods and to shippers of every form of package merchandise.

The excellent color printing on Gair Corrugated Cases has spirited advertising value —the application of heavy inks smoothly and neatly is a Gair manufacturing trait very serviceable to the customer and peculiar to Gair Quality.

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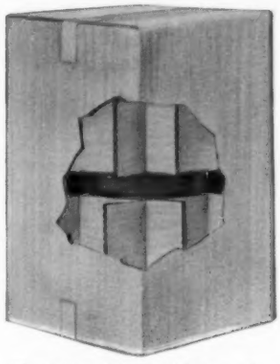

The whole set within the sheltering walls of a Corrugated Case for transportation.

Five Box Board Mills. 1000 tons daily

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The Guiding Hand

Hour after hour a graceful monoplane throbs across a vast ocean, searching a path from continent to continent through fog and storm. Like a mighty helping hand rising from the depths, radio points the way and keeps a wondering world informed.

The tiny wires which constitute the radio apparatus are the unseen nerves which are sustaining the navigator of the air on his trackless route. They must respond instantly to every command. Without the radio apparatus, which is an essential part of every long distance plane, the conquest of the air would be impossible.

Dependable magnet wire and coils are indispensable—for one failure—one short circuit—might mean disaster.

Dudlo takes pride in its belief that in making copper wire products which stand the severest tests, it is contributing to man's triumph over the elements.

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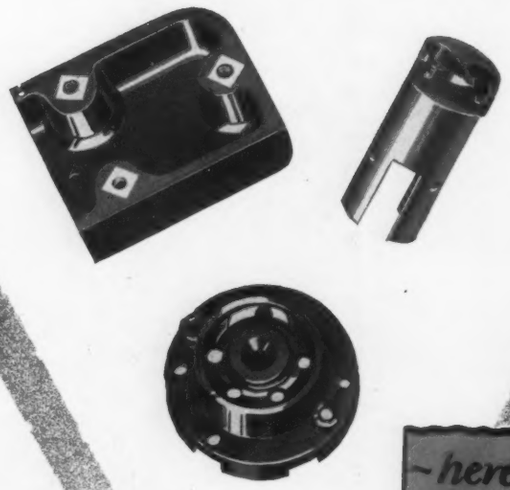

—here's a new chapter!

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OVER a generation of moulding service to all industries has built Scranton into moulding history in an enduring way. One proof of this fact is that Scranton operates the largest and best equipped moulding plants in the world.

Electrical manufacturers, when seeking possibilities for the use of moulded composition in their products come to Scranton for advice. And the reliability and resources our forty years experience has given us never fail them.

Scranton accuracy, uniformity and finish are a foregone conclusion, in any form or number, in "LACANITE" "PHENOLIC" "BAKELITE". We will be glad to quote you on blueprints or specifications.

Scranton moulds retained by us are always repaired, insured and renewed if necessary, without additional expense to the customer.

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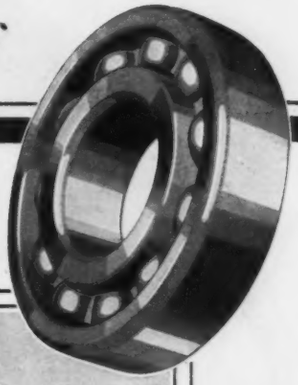


888

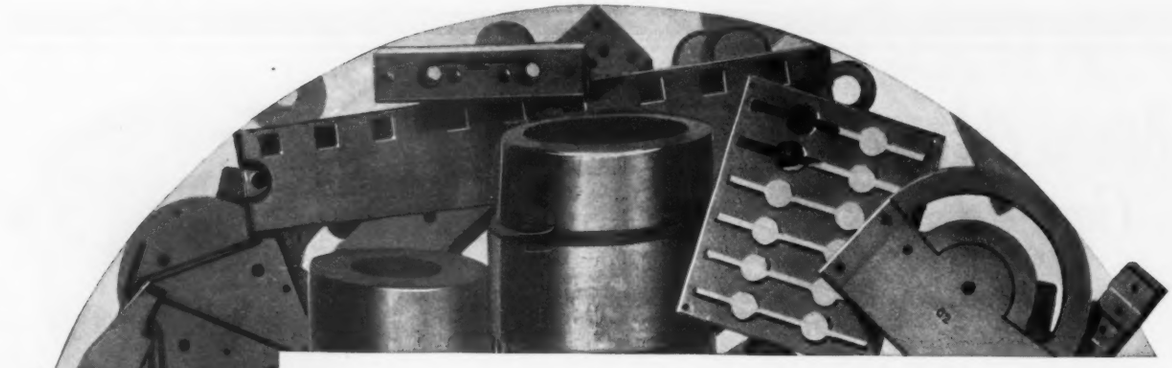
ELECTRO DYNAMIC is one of more than fifty manufacturers supplying general purpose electric motors with ball bearings as standard or optional equipment.

The battery of Electro Dynamic - New Departure - equipped electric motors shown drives special machinery that *must* run continuously for many hundreds of hours.

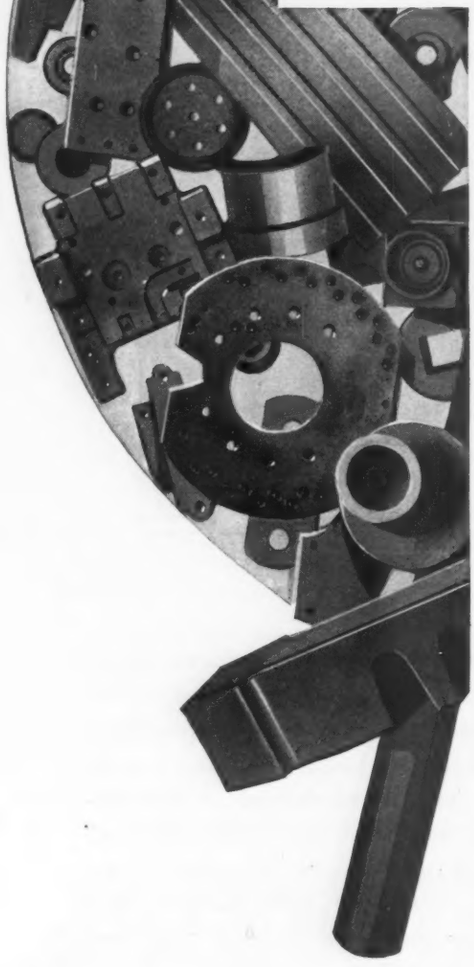
Infrequent lubrication, no bearing adjustments, continuous service without replacement, and maintained accuracy of rotor shaft centering are some of the advantages New Departures give this inaccessible, closely mounted equipment.

All advantages and maintenance economies obtained by the use of New Departure Ball Bearings are fully explained in Booklet" K" and "Cutting Your Costs". Write for them today. They are yours for the asking and may save you many dollars.

The New Departure Manufacturing Company, Bristol, Connecticut; Detroit, Chicago and San Francisco.



For Moulded Forms



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Monolithic . . . Substantial

THE working conditions which are met by moulded insulation are widely varying. Yet in all cases it is safer to use a material which is free from splitting, impervious to water, and has a high dielectric resistance.

Johns-Manville Asbestos Ebony is made from asbestos fibres and a specially compounded Portland cement combined into a rigid monolithic material which can be moulded to meet your requirements.

On battleships and dredges, in power houses and mines all over the world, Johns-Manville Asbestos Ebony is famous for its performance as switchboard panel material. This same performance is to be counted upon when the same material is used in moulded form.

We are always glad to estimate or make suggestions regarding the use and cost of moulded Asbestos Ebony. *Address Electrical Department, Johns-Manville Corporation, at New York, Chicago, Cleveland or San Francisco.*

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MOULDED ASBESTOS EBONY

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Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 2 SEPTEMBER - 1928 Number 3

THE MIGRATION OF INDUSTRY

By MARTIN J. INSULL*

President, Middle West Utilities Company

THROUGHOUT the great industrial progress which has been made in this country, we may observe a note of regret at certain accompanying characteristics. The most familiar of these is the congestion of population in large cities, with its many attendant disadvantages and discomforts. For a long time we were content simply to say that this was the price of industrial progress. Now we are finding out that it is not necessary to pay this price for industrial progress. The development of power distribution has today progressed to the point where adequate and economical power is available at almost any point. Simultaneously, the development of transportation facilities has served to emphasize the possibilities of decentralization of industry and, consequently, a more satisfactory distribution of population. I know of no healthier form for the economic development of this nation to take than this efficient utilization of the broad areas which are at the disposal of our industries, if only they have the perception to take advantage of it.

We, therefore, feel our desire that this decentralizing tendency be encouraged is consistent with the national welfare.

WE also know specific undisputed reasons why decentralization is a good thing for industry itself and for the people employed in industry. Living costs are lower in the small communities, and, therefore, a lower wage scale is as effective in purchasing power as high wages in cities. Pleasant living conditions are within the reach of moderate incomes. It is possible for employees to own their own homes, and this contributes to productiveness, permanency and conservatism of the personnel. Valuable human energy is conserved because the fatiguing effects of congestion are eliminated. Land is both cheap and plentiful in the smaller towns. Taxes are conspicuously lower. Railroad terminal facilities are less crowded and tie-ups in shipping are, therefore, averted. Industry can get closer to its raw materials and to its market.

On the other hand, we recognize, as we must, certain obstacles to industrial decentralization. One is inertia—often, of course, justified by the inconveniences of moving. In other cases a particular type of skilled labor may be found only in certain localities or certain large cities.

THERE is also the economic tendency of industry and business in general to consolidate into large units for cheaper production and marketing. This is leading to one or more large primary plants being located at central points, with regional or secondary plants distributed more or less all over the country. This tendency, however, hardly can be anticipated to eliminate the small manufacturer who, for some particular reason as to type and class of product, or unusual managerial and productive skill, will always hold a share of the business.

From the standpoint of industrial migration or location, the most significant thing about decentralization and its corollary, the industrial develpment of the small town, is that it holds no brief for any particular section of the country It leaves that to be determined by the peculiar features of the industry in question. It thus becomes universal in its application. We say to an industry, "Let the section of the country in which your plant is to be located be one which is most profitable from the standpoint of available raw materials and accessible markets. But once this is decided, consider carefully the possibilities of putting the plant in a small town in the section selected, rather than in a big city."

* *Excerpts from an address delivered by Martin J. Insull at a private conference called by Haley Fiske, President of The Metropolitan Life Insurance Company, for the purpose of exchanging ideas on the migration of industry.*

Some Labor Problems *in a* New Branch Factory

An outline of some of the experiences of the Belden Manufacturing Company in organizing its working forces in a new plant at Richmond, Ind.

An interview with

WALTER RUDOLPHSEN

Superintendent, Richmond, Ind., Plant, Belden Manufacturing Company

BY LEON I. THOMAS

STARTING a new plant in a city somewhat distant from the old plant brings up a great variety of problems. We think we know because we have just been through such a procedure. While perhaps some of these problems have been brought about by the circumstances surrounding our own case, I feel certain that practically all of our experiences have their counterpart in any manufacturing organization which attempts to locate in another town.

We built our new plant for the rubber covering, braiding and cord manufacturing of electrical wire products in Richmond, Ind., and we started operations there in the latter part of February of this year. Previously our plant for this class of work was located in Chicago.

The object of the move was primarily to obtain the advantages of the labor market existing in this thriving city of 35,000 people. And located as it is, pretty well down the state and practically on the border line between Indiana and Ohio, there are also strategic advantages as regards geographic relation of markets, both of raw materials and finished products.

Moving to a new location does not begin with conferences with architects. At least it didn't with us. In the latter part of 1926—a little over two years prior to our actual occupancy of the new plant—we began a labor survey of the territory. This was undertaken to determine the approximate savings in wages we might expect over the Chicago territory. This preliminary survey was not particularly detailed in its scope, nor was it planned to be. It was made by a representative from our Chicago plant who came to Richmond and interviewed a number of employers of labor in company with the representative from a trade association who had had some experience in this work and was familiar with labor conditions in the State of Indiana.

This preliminary survey gave a general picture of the situation and revealed a sufficiently attractive set of facts to warrant a more detailed study which was made later, after it was definitely decided to build the new plant.

This more detailed labor study was also made through the medium of personal calls, only this time the president, comptroller and the time-study man took part in it. Not only were wage scales gone into thoroughly, but comparison was made between the operations already being done by employes of other concerns in the city, with those we were going to require in our own plant.

Thus, even before the foundations of the new plant were placed, we knew pretty well what to expect in the way of meeting our labor requirements.

So far we had been looking at the problem in a general way. Now came the specific task of forming a nucleus of employes that we could take to Chicago for training in the actual work they were to do later in the new plant.

As a starter an advertisement was run in the local newspaper setting forth the proposition and asking for applications. From these applicants a representative from the

Practically all of the working space of this new plant of the Belden Manufacturing Company at Richmond, Ind., is spread out over a single floor, thereby simplifying the materials handling problems, as all the movements of materials are on a horizontal plane. Furthermore, located on the outskirts of the city, as it is, there is ample room for future growth without vertical expansion

Chicago plant right on the ground in Richmond selected a group of people with the ultimate idea, after a thorough training, of fitting them into minor supervisory positions.

In addition to these people another group was selected with the idea of their remaining in productive positions to form the nucleus later on of the great bulk of workers.

Then came the question, on what basis were they to be paid during the training period in Chicago. It will be readily appreciated that this question was worth some thought because we were taking people from a district of relatively low living cost and low wage rate into a territory of high living cost and high wages, for a period of months, and then returning them to their former conditions.

It might be expected that this would introduce the hazard of loss of employes after training rather than take a reduction in wage upon their return, but this did not present the difficulty that might be expected, probably largely because the plan was carefully explained to them in advance and full reasons given. Then too, there were home ties which constituted a large factor for they would tend to draw these people back to Richmond.

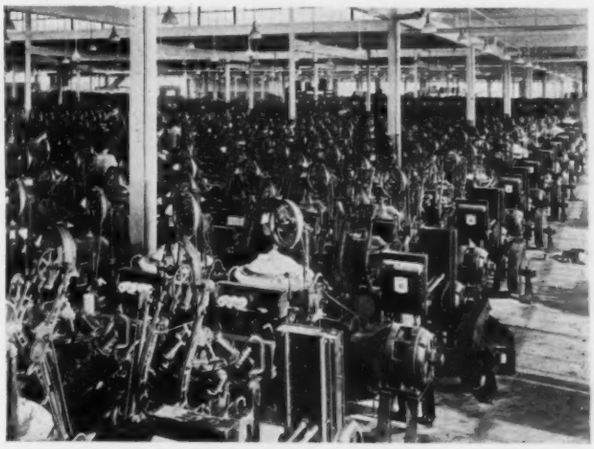
Depending upon the difficulty of the individual operations, the training period in Chicago ranged from two to nine months. In accordance with this varying degree of skill required, the training periods were scheduled so that they would all be completed at practically the same time, when the entire crew under training in Chicago could be returned to Richmond.

When the new plant was ready for operation and we started hiring local people we found ourselves with first, a well trained group of people for the supervisory positions and second, an equally well trained nucleus of productive workers.

To give a picture of the size of the plant it should be added at this point that we now employ in Richmond about 225 men and 180 women.

I have been asked, "If you were to go through it again would you repeat what you did before or would you follow some different procedure?" That is a perfectly fair question and one that is naturally of interest to anybody who has such an experience ahead of him.

I think I am right in saying that if we were going to start another plant in another city we would do as we did in this instance, with the probable exception that we wouldn't worry much about that nucleus of operating employes. Rather we would probably bring to Chicago for training a larger number of people who were ultimately intended to be supervisors.



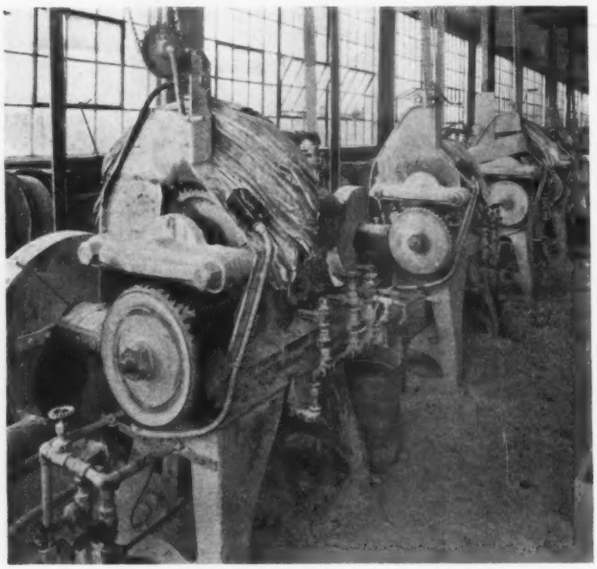
The individual and group motor drives for the many different types of machinery, with their closely adjacent control apparatus, are much in evidence in this and the other illustrations

Then, we had another difficulty which I presume is quite common when you move people in executive positions from a large city where they have lived, if not all their lives at least for a considerable period, into the environment of a relatively small town. Three out of seven people in this classification, whom we brought from Chicago were so unhappy in the new surroundings that they finally gave it up. They were for the most part quite enthusiastic about it until the actual time came that they were transferred to Richmond. The lesson from this is that this condition should be foreseen and if possible eliminated either by a

Because of the single-story construction, only small pillars or columns are required, and this means that there is but little obstruction to the light. Even the partitions between the different sections of the building are, for the most part, glass, as may be seen from the illustration. Another advantage of this type of construction is in the setting of special machines that require pits

thorough warning or a trial residence in the new town well in advance of actual starting of the plant. By following this sort of procedure embarrassing production emergencies may be eliminated.

For those whose managerial experience has been in city plants, there may be interest in some of the problems we have met in Richmond and which I presume are peculiar to



As may be seen from the illustration above much of the equipment in the new plant of the Belden Manufacturing Company is very complicated, requiring special training for its operation

people of the smaller manufacturing communities. In the first place the whole thing is flavored with this fact—that the standard of living is on quite different planes in Chicago and in Richmond. In the smaller city the environment is such that the workers' needs are relatively small and the effort necessary to meet those needs is not great. Hence, there is not the urge to hustle that there is in the larger city with its greater demand upon the time and upon the pocketbook of the individual. People are not obliged to hustle in the smaller towns and they don't without some special form of incentive.

Of course we were not blind to this situation, so at the outset we saw to it that some form of wage payment incentive should be put into effect. No one plan fits all situations throughout the land, or even all the needs within a single manufacturing organization. So we have put into use more than one wage payment method. These are so arranged as to include the men in one group and the women in another as in our case there is a distinct difference in the kinds of work performed by each class.

In our new plant we started the men on a group piece-work plan in which the operators were guaranteed the day work rate. But it was difficult to bring the employes to a state of efficiency where their earnings were high enough to warrant their staying on the job. To correct the situation temporarily, we wiped out the incentive plan and put in a straight day work plan on a new basis. The maximum day work rate under this plan is 10 per cent less than what we had figured would be the earnings under the incentive wage when the workmen were sufficiently skilled to undertake this plan. Thus it is, we still have sufficient leeway to make the incentive plan workable when the proper degree of skill has been obtained to make this feasible.

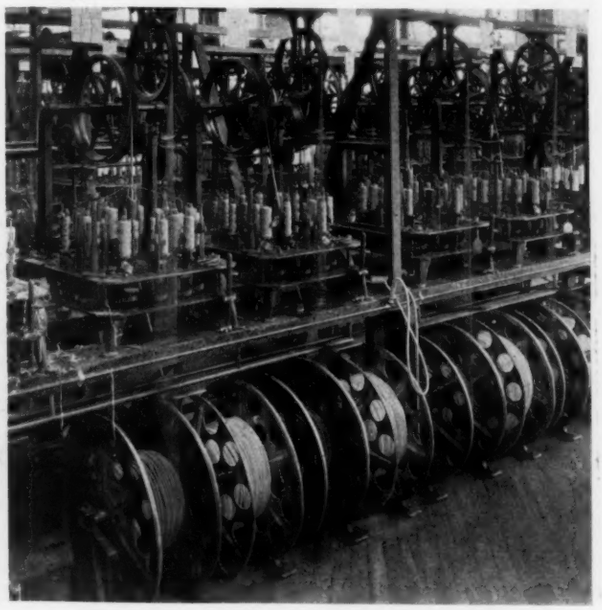
In the case of women employes we started them on straight piece-work and it is satisfactory to a degree that warrants continuance of the plan.

The simplicity of straight piece-work is always in its favor, and particularly is this feature appreciated when you are dealing with people, who for the most part, have not had extensive experience in factory work. Earnings are easily calculated by the employees themselves. There are none of the doubts in their minds as is so often the case where intricate bonus arrangements are in force.

It should not be inferred from what I have said that the advantages of the new location do not greatly outweigh the disadvantages. I have simply tried to make the point that a peculiar set of problems is likely to arise under such circumstances—problems which may tax the plant manager who has never been through them or who is not warned what to expect.

So it is with this thought of possible helpfulness, which usually comes from an exchange of experiences, that the facts brought out in this article are contributed.

In the production of many of the smaller products made by the Belden Manufacturing Company in its new plant at Richmond, Ind., light is very essential to efficient production



Intricate braiding machines were quickly mastered by the newly trained employes that had been taken to the principal factory of the company in Chicago for complete instructions in their operation

Analyzing the Small Business to Increase Net Returns

Facilities available to the small manufacturer in the Department of Commerce which aid him to find defects in his methods that reduce his profits

THERE are said to be in the United States about one million business men whose net income is probably so modest that they cannot afford to devote sufficient time or money to the solution of their own problems of production or distribution. For this reason the Department of Commerce has made available the results of industrial and commercial research which probably none but the largest concerns could attempt for themselves. The nature and scope of these services are described in a pamphlet entitled "Practical Aids to the Independent Merchant" and the accompanying article outlines the importance of this pamphlet to the manufacturer.

THE EDITOR

THE status of the small independent merchant or manufacturer in our present commercial structure is a subject that has received much attention of late, from economists and students of business problems. There are said to be in the United States over 750,000 retailers, each doing less than $25,000 worth of business annually, and nearly 150,000 manufacturers whose yearly production is less than $100,000 each—in other words, about one million business men whose net income is probably so modest that they could not afford to devote sufficient time or money to the solution of their own problems of production or distribution. For this reason, the Department of Commerce makes available the results of industrial and commercial research which probably none but the largest concerns could attempt for themselves. The nature and scope of these services are described in a pamphlet "Practical Aids to the Independent Merchant," prepared by Dr. Julius Klein, Director of the Bureau of Foreign and Domestic Commerce.

After careful study of the situation it appeared that the small business man with native ability and willingness to work, adaptability and a reasonable margin of capital, has as great an opportunity for success as ever before. In business where success depends mainly on taking advantage of changing trade opportunities, close contact with market conditions and expert personal superintendence of operations, the small operator has many advantages over the large establishment. The resourcefulness and freedom of action of the individual, probably the most important factors in the maintenance of American business, and the opportunity for personal attention and service, will always go far toward offsetting the advantage of large-scale operations of the more complicated organizations. The man who is willing and able to take advantage of new methods or new developments puts himself in a position to meet competitive conditions. To him this pamphlet will be a valuable guide to the assistance which he may expect from the Department of Commerce.

The small business man who is striving to keep pace with changing conditions is often hampered by not knowing where to go for the trade information he wants. There are in the Government service vast sources of knowledge of real practical value to him. It was for the purpose of pointing out these sources that the Department of Commerce decided to compile this brochure, briefly outlining the ways in which it can be of value to American business men, particularly to those merchants who do not have the facilities to carry on special investigations or to collect information on their own account. The department functions to assist business by undertaking, in full cooperation with those to be served, the fact-finding investigations which business men, either collectively or individually, cannot conduct to better advantage for themselves.

Among the problems which the Department is studying and which are perhaps of greatest interest to the independent merchant are those dealing with retail distribution and marketing. Mass production has brought about remarkable changes in merchandising during the last quarter century—changes that have tended to upset methods of distribution and which are deemed fixed and unalterable. The old order of wholesaler, jobber and retailer has developed into a somewhat confusing system where manufacturers are retailers, wholesalers own or control retail stores, and retailers own wholesale establishments. This confusion, which exists in connection with distribution, complicates the problem of efficient business administration and gives rise to a certain amount of distrust among the consuming public.

The "elimination of the middleman" is a meaningless expression, because the functions of the middleman have to be performed whether by individuals or by branches of the chain store organizations. Whether the individual middleman will continue to operate to the best advantage depends largely upon the conduct of his business.

Recent studies by the Department of Commerce show that the profits of many wholesalers and retailers alike are being dissipated through practices, such as the handling of unprofitable items, soliciting unprofitable customers, striving for volume without regard to costs, and the use of uneconomic credit practices. In a wholesale grocery analysis it was discovered that one wholesaler carried 2100 separate items in his inventory, although four items accounted for nearly one-half of his total sales. At the same time, representative grocery chain-store warehouses handling a much larger volume of business included only 700 items. Moreover, the chain stores secured stock turn-overs twenty times annually, while the wholesaler had a stock turnover of only seven times. It is obvious from this that the mark-up of this wholesaler based on the average expense of doing business would necessarily cause certain items to bear a disproportionate share of the operating expense.

An analysis of wholesale hardware operations revealed one case where a wholesaler increased his dollar profits 35 per cent, by dropping his unprofitable accounts which amounted to half the total, cutting his sales territory by a third, and reducing his inventory almost one-half.

A study recently issued on the subject of analyzing retail selling costs revealed that certain commodities cost nearly three times as much to sell as others. Another study into retail profits through stock control shows how one progressive merchant was able to solve many of his problems by means of a simple method of record keeping through which he was enabled to pick out and discard those items for which there was little or no demand. Idle merchandise, with its accumulating burden of costs for storage, interest, insurance, taxes, shrinkage, depreciation and absolescence can make it difficult and frequently impossible for a merchant to remain in business unless the accumulated burden is passed along.

Business men are urged by Dr. Klein to take even greater advantage of the unique and varied facilities of the Department of Commerce to help solve their commercial problems. The pamphlet which has just been issued gives a brief outline of the different ways in which the Department can be of practical assistance. It can be obtained without cost upon request to Washington or from the offices of the Bureau of Foreign and Domestic Commerce which are located in most of the commercial centers of the country.

Services Rendered by Nema to Electrical Manufacturers

The activities of the National Electrical Manufacturers Association are summarized briefly in the accompanying article and chart

THE primary object of every trade association is to serve its members, its industry and, more indirectly, the public. Obviously, the organization problem confronting such an association is almost limitless in its size and scope. In order to present a comprehensive picture of the services it is rendering to the electrical manufacturing industry and related groups, the National Electrical Manufacturers Association, New York, has prepared the chart reproduced on the opposite page.

Nema activities originate in the sections. Structurally speaking, therefore, the individual section is the foundation of the Association's work. The various sections are composed of member companies—manufacturers—who are making the same products and who are naturally interested in the same problems. It is this division into small units and the segregation of mutual interests that properly serves to bring out most efficiently questions for discussion and solution. Section activities are further integrated into the working program of the association through the divisions to which the sections belong.

Divisions of the Association

THE past set-up of Nema has provided for five divisions —Policies, Apparatus, Supply, Appliance and Radio. At a recent meeting of the Policies Division at Association Island, New York, it was decided that a more flexible arrangement of the divisions might make for more effective work on the part of the association as a whole. The five divisions already named were in reality a carry-over from the days of the Associated Manufacturers of Electrical Supplies, the Electric Power Club and the Electrical Manufacturers Council, which were amalgamated in 1926 to form the National Electrical Manufacturers Association. The A. M. E. S. came into Nema as the Supply Division and the Electric Power Club as the Apparatus Division. The Policies Division, as a working group of the Association as a whole, serves to coordinate all interests. The Appliance and Radio Divisions complete the present divisional arrangement of Nema.

When the Policies Division provided for the regrouping of divisions—with the exception of the Radio Division and itself—it did so for the express purpose of permitting a more logical regrouping of sections. When further action is taken in coordinating section activities within new divisions, it is expected that even greater efficiency will result and the service of Nema to the electrical manufacturing industry will be augmented.

In the chart which is reproduced on the following page the National Electrical Manufacturers Association has drawn up a complete index of the services it is rendering. The classes of manufacturing recorded across the top of the chart are indicated for information only as, of course, there is no cross-reference in the chart proper. The headings under "Classes of Manufacturing" include the present sectional groupings within the Association, but do not specially refer to them.

Publications and file references are completely listed and indicate the very comprehensive service Nema is rendering the electrical manufacturing industry. The services thus described relate to the general classifications of policy and management, engineering, manufacturing, sales and general. In outlining these activities and services the Nema chart indicates, in their proper places, some of the principal publications of the Association and the names of some of its committees.

Too much emphasis cannot be placed on the need for and importance of standardizing the electrical product. In this field particularly the National Electrical Manufacturers Association is making a contribution of incalculable value. It has in its Standards Committee a remarkably complete and efficient organization and procedure for obtaining and recording an industry consensus of opinion on any technical subject. As an association, Nema is in close contact with the American Engineering Standards Committee, the American Institute of Electrical Engineers, other trade associations and the Department of Commerce. Each industry group (represented by a Nema Section) prepares its own standards, acting as an autonomous body.

These standards are correlated and approved by the Nema Standards Committee and are published in the form of handbooks. More than ten handbooks of standards are available on the general fields of radio, supply, apparatus and appliances. These books are revised to meet current industry developments. Another phase of Nema's standardization work—and one that is of equal importance though in a different connection—is that relating to uniform cost accounting. A publication on that subject, now in its fifth edition, is the "Standard Accounting and Cost System for the Electrical Manufacturing Industry." The electrical manufacturer will find this book of exceptional value.

Other Nema Publications

THE collection and dissemination of statistics on the stocks and sales of radio jobbers and dealers, collected since September, 1927, in collaboration with the Department of Commerce, is one of the valuable services rendered by Nema. Four quarterly returns have been issued to date, commencing with the returns for October 1, 1927. "The Radio Market," a Nema publication which analyzes and presents these statistics in graphic form, has enabled the manufacturer to coordinate his budget, production, purchasing and sales quotas. This book will be brought up to date and reprinted early next year.

The service performed by Nema in visualizing in chart form the work it is doing is a valuable one for the electrical manufacturing industry, and is an example that many trade associations could well afford to follow. The chart spotlights in turn every important phase of the association's work, and the list of file references indicates an efficiency of organization and lends an assurance of permanency to all Nema services.

The National Electrical Manufacturers Association

A General Index of the Services Rendered to the Electrical Manufacturing Industry and Related Groups

This chart prepared and copyrighted September, 1928, by the National Electrical Manufacturers Association

Classes of Manufacturing

Generation and Conversion	Control and Measurement	Conductors	Transmission and Distribution	Communication	Utilization		
					Power	Heat	Light
Generators Rotary Converters Rectifiers Batteries, Primary Batteries, Secondary	Instruments Meters Industrial Control Porcelain Insulation Other Insulation	Wire and Cable Carbon Resistance Alloys	1. Primary Power Switchgear Transformers Line Material Insulators 2. Secondary Panelboard Distribution Board Switches Circuit Breakers Conduit and Raceways Wiring Devices	Radio Signaling Apparatus Traffic Lighting	Industrial Transportation Commercial Appliances Domestic Appliances	Furnaces and Ovens Welding Cooking Domestic Appliances Therapeutic	Incandescent Lights Arc Lights Other Lights Street Lighting Units Commercial Units Other Units

Services Relating to

		Publications and File References	File No.
Policy and Management	NEMA Membership	Function and Purpose of NEMA—Constitution and By-Laws—Manual of Organization	101
	Labor	Labor Committee of NEMA—The Labor Committee and Its Work	102
	Conciliation	NEMA Conciliation Committee	103
	Contacts with: Congress	Law and Legislative Committee	104
	Contacts with: Government Depts.	Actions taken regarding national legislation	105
	Contacts with: State and Local Depts.	Method of cooperation in regard to state and local legislation	106
	Contacts with: Underwriters	Underwriters' Laboratories Committee	107
	Contacts with: Other Bodies	N. E. L. A.—A. I. E. E.—A. E. S. C.—S. E. D.—A. E. I.—etc. Industry Relations Committee—Manual of Organization	108
	Uniform Statute	Need for Uniform Ordinance—Uniform Electrical Ordinance—Uniform Statute	109
	Legal Review	NEMA retains counsel who reviews all minutes of the Association	110
	Cost Accounting	Standard Accounting and Cost System for the Electrical Manufacturing Industry	111
	Tariff	Tariff Committee and its work	112
	Code of Ethics	NEMA Code of Ethics—Business Policies Committee and its work	113
Engineering	Technical Standardization	The NEMA Standards Committee	201
	American Standards	The A. E. S. C. and How It Operates	202
	N. E. Code Development	The Casualty and Fire Prevention Committee—The National Electrical Code (Purpose and Development)	203
	Safety Code Development	National Electrical Safety Code	204
	Simplification	NEMA policy with Department of Commerce on simplification projects—Bureau of Standards	205
	Published Standards	Published Standards on Radio—Supply—Apparatus—Appliances	206
	Instruction Books	Care and Installation of Transformers	207
	Other Organizations	Industry Relations Committee—Cooperates with outside bodies in matters of mutual interest	208
Manufacturing	Factory Management	(Facilities available through the action of related committees such as Conciliation Committee, Labor	301
	Personnel Problems	Committee, Business Policies Committee, to give matters of this kind consideration by qualified	302
	Safety of Workmen	groups or individuals)	303
Sales	Statistics: Orders Entered	Twenty product groups reporting statistics on annual, semi-annual, quarterly and monthly	401
	Statistics: Shipments	basis, covering 20 lines and 140 items. The figures include orders, shipments, stocks,	402
	Statistics: Stocks	etc. NEMA Statistical Department	403
	Statistics: Miscellaneous	The Radio Market (dealer and wholesaler stocks)	404
	Statistics: Closed Transactions	Statistics on closed transactions	405
	Market Development: Industry Sales Conf.	Electrical Industry Sales Conference—Cooperative Market Development—Relations with S. E. D.	406
	Market Development: Producers Council	The Producers Council and How It Operates	407
	Market Development: Rural Electrification	Committee on Relation of Electricity to Agriculture	408
	Market Development: Market Analysis	Market analysis studies in cooperation with interested bodies	409
	Market Development: Shows and Exhibits	NEMA Policies on Shows and Exhibits	410
General	Staff	Trained staff includes managerial, statistical, publicity and engineering personnel	501
	Publicity, Publications	Service includes newspaper and business press releases, NEMA News, Standards notes, etc.	502
	Information	Information service on a wide variety of topics relating to electrical manufacturing	503
	Meeting Facilities	Meeting rooms at headquarters available by arrangement with office manager	504
	Miscellaneous	Meetings arranged, reservations, employment service, secretarial, etc.	505

Association Work and the Sales Barometer

Associations can do much that an individual firm cannot, and the success of association work is developing a new conception of its service to business

By M. F. Flanagan

Executive Secretary, Radio Manufacturers Association

IN thinking about modern associations, the cause of their conception, the reason for their perpetuation, progress and prosperity, and the growing tendency in favor of this type of organization to further the interest of trades and industries, it is well to bear in mind this fundamental fact—that the first thought toward coordinated effort on the part of any group collectively interested in attaining the same primary result is a forceful indication that within that group is the realization that the narrow restrictions of individualism, the shallow jealousies of competition, and the provincialism of an ante dated age of business do not mesh with the methods that must be followed today to successfully maintain a respectable position in relation to opposing forces.

Growth of Association

In the past few years association effort has become firmly rooted in a large variety of places in the business, professional, technical and even scientific worlds. But regardless of their purpose and ideals, they were originally started for the same basic reason—to protect, to educate, to further the welfare of a given body of people—to help solve their problems, to guarantee their economic security.

The radio industry was hardly knee high when it was over its head in a morass of world wide popularity, with all the intricate trade situations that such rapid development would naturally bring about. The result was that this baby business became a giant industry almost overnight. The effect had an immediate reaction on a number of the more important trade channels, and in some instances was responsible for an entire change in their former methods of merchandising. Certainly radio can be credited for producing a stimulation that has not seen an equal in the history of American business. It was at the period of infancy that a small group of leaders in the industry recognized the necessity for organization. And so the Radio Manufacturers Association had its birth not long after that of its parent. In the few years that have followed, this association has come to exert an influence upon every phase of the radio business. It has definitely stabilized and equallized conditions existing between manufacturers of radio apparatus, their jobbers and dealers, and to a certain extent governed relationship with the radio public.

It is not strange that the electrical industry should have been among the first to recognize in radio an opportunity for a rich exploitation and that it has maintained until the present moment a high record of sales and a substantial place in the cycle of radio distribution.

Credits, patents, employment, traffic, legislation, conventions, trade shows, publicity, merchandising and many other activities are all at present efficiently departmentalized and under the supervision of committees that operate in finished style. But these phases of association work are not particularly new or inspiring. They are accepted and are becoming routine. The success of association work is developing a new conception of its service to business. And in that connection, I should like to give you the impression I have of how the philosophy of association work has a definite bearing on the sales barometer.

The root of sales success lies deep in the soil of trade relationship. Pioneering with any trade is perhaps one of the most difficult of all selling tasks. It is not only difficult, but it presents the perplexing problem of high sales costs, and from the salesman's standpoint is responsible for high mortality of men in the ranks. The industry that has an association in the background can save itself this terrific expense of man, time and money. One of the elemental functions of cooperative work by competitors is the establishment of equitable trade relationship ethics, first among themselves, and ultimately and inevitably between them as an industry and the trade. Progressive associations have learned that the time for such work is at the outset, not after the industry has its back against the wall. With the road paved for them in this manner, a sales staff will lead off with a great advantage.

There is much that an association can do in this direction, with the power and resources at its command, that would be almost a physical impossibility for an individual firm, with the same amount of effectiveness and time. There is also the ability of an association to bring the selling message of the industry it represents to the trade and the public without the resistance of any trade mark or firm name to minimize its effect. Such a program in the paint and varnish industry, for example, soon became the dominant note, against which even the largest single advertiser appeared relatively insignificant, although it added to its members advertising a value that is difficult to estimate.

There is scarcely need for intimating the tremendous cooperation such a campaign has in building sales. The economy of such advertising for individual contributors is especially noteworthy, not to mention its immense value all the way through the sales and distributing channels in enhancing the good will estimation of even those remotely interested, and whose profits from the increased returns are not taxed for the publicity fund. It is needless after this explanation to dwell on the exceptional influence association advertising has on the public at large.

Associations have been prominent also for the important part they have taken in the reduction of selling costs, the scientific analysis of markets, the reduction of credit losses, their ability to bring to members the interchange of patents held within the association roster, and the expertness with which they have combatted adverse legislative methods that have threatened their industries. It cannot be disputed that sales are intimately associated with these things.

Parent associations, it may be said, have given rise to the more intensified grouping of jobbers, dealers and salesmen.

Merging Common Interests

More and more business is learning the soundness of merging their common interests for the common good. It is becoming a greater practice for association members to take into the association circle the interests of those with whom they deal, and those who are directly responsible for business. The philosophy of association work, the sentiment that actuates it, is based on the science of business as it is conducted in its highest and most profitable form.

Regardless of your relative place in your trade, learn to take more out of your business by learning how to appreciate the wealth that is stored up for you in your association, and which is yours by virtue of a reasonable amount of activity.

It may be predicted that the association of tomorrow will be the mentor of commerce in its every phase.

How to Use *Business* Statistics

A summarization of a pamphlet issued by the Department of Commerce at Washington in which Mortimer B. Lane, editor of Survey of Current Business, relates briefly the history of business statistics, how they are compiled and how they are used in business to forecast future trends

THE use of statistics and current business facts as a means for forecasting future business trends is now quite general in many of the larger commercial enterprises and manufacturing industries of the country. In fact their use is recognized today as a necessity in many kinds of business. They are an invaluable aid, once they are thoroughly understood, with respect to planning budgets; forecasting material markets for future purchases; determining quantities of production, and in the general control of any business, be it large or small.

Until within the past few years, the average business man, in his quest for information as to the trend of conditions, sought out other business men in order to confirm his own opinions and the showing of his company, for he realized that the figures of his own business were not necessarily representative of general business trends, but that his company could be vitally affected by these trends. A few of such opinions, however, did not solve the problem. They were formed in the same manner as his own and were subject to the same limitations. Besides they were often contradictory.

While such practices might have been acceptable, in the absence of better data, in past days when business enjoyed comparatively liberal profit margins, they have proved absolutely unsatisfactory in the present day of keen competition and small margins of profit in all classes of business.

Today the business world has a means for providing an answer to the question of business conditions, so that any executive can obtain accurate facts instead of relying upon mere opinions. The solution is to be found in the collection and compilation of actual current facts from each important representative industry or trade, to form a composite picture of the business situation therein. With these statistics at his command and covering the principal industries of the country, the business executive of today can determine exactly the trend of business in a simple yet correct manner.

The rise of statistics from a small beginning to a position of importance in commerce has been in response to the growing needs of business. No business executive can have either in his mind or in the possession of his own concern all the facts necessary for intelligent business judgment. He must not only know how his firm is doing, but he must be able to compare his business with industry as a whole, and he must know the buying conditions of his customers as well as the condition of the material markets. These data he cannot get within the confines of his own organization, but must look to agencies who make a practice of collecting figures from an entire industry.

Current business statistics are not new. Price data may be found in commercial papers extending back for almost a century. Commodity exchanges were also early entrants into the field, but most of the early private figures were financial in character. Few industrial data, prior to the twentieth century, were available month by month, and such figures as were gathered were compiled mainly for financial papers or by the Government in connection with its needs.

During the first decade of the twentieth century statistics having to do with industrial enterprises began to be collected. Trade papers assembled some of these, while trade associations also came into the field, at first largely in connection with data on credits and general financial conditions. By about 1910 many monthly reports on their respective industries were compiled by various associations.

With the development of these reports they came to be used as statistics representative of that industry. Then, besides the mere analysis of statistics at different times, many organizations put these figures to work in a comprehensive plan for the conduct of their business. This gradually led to the more extended use of statistics until today, as has been stated, they are being used extensively in most every line of industry and commerce to forecast future business trends.

"Statistics are a natural development of the growth of business and of the need for greater knowledge of our national life. Business statistics have helped to mitigate the fluctuations in business, commonly called the business cycle. Budgeting, based on statistics, has enabled firms to stabilize their business and secure greater profits. Business leaders state that larger benefits are derived from current statistics. Predictions from statistics are not always right, because of inaccurate and incomplete data, inadequate previous experience or lack of knowledge of the industry, but interpretations are becoming better in the light of more experience. Statistics are as vital in business as is the compass to the mariner. The business man must have information on the trend of business conditions in order to base his policies on facts instead of guesswork. Current business statistics have proved these facts and have enabled large savings to be made by many organizations."

MORTIMER B. LANE

Recognizing this fact, and in order that the many advantageous uses of business facts and statistics might be better understood, the Department of Commerce has issued a booklet entitled "HOW TO USE CURRENT BUSINESS STATISTICS." It is a ninety page pamphlet prepared by Mortimer B. Lane, editor, Survey of Current Business, and contains information relative to the collection and compilation of statistics, with particular emphasis on their uses and the manner of analyzing them.

The booklet is essentially divided into four sections. One of these treats in general of statistics, the facts leading to their general use, and a discussion of their application to budgets. Another section has to do with the application of statistics and business facts to forecasting and planning business trends in the larger industries. In this section it is explained that concerns may apply to their own industry the principles used by other industries, and that the most popular usage is the comparison of one company's figures with

(*Continued on page* 154)

The Trend Toward COLOR on the *Merchandising*

Reports from manufacturers, jobbers, vergent as to the bearing of the color yet the general consensus appears to

WITHIN the past few years there has been a decided trend toward the use of color in the home. This has been particularly noticeable with respect to kitchen utensils and many of the smaller electrical appliances. But, despite the fact that the movement toward the use of color in such devices has been profitable to many manufacturers there still remains the question as to whether this trend is but little more than a passing fad, and whether a manufacturer of electrical appliances will be justified in changing his products to conform with the movement. Many of them have done this to a certain extent. Some report increased sales as a result. Others contend that there is little difference in the sale of their devices whether they are in keeping with the color trend or not. Some dealers in electrical appliances say they do notice that younger couples, brides and those who buy appliances for the home as gifts have a slight preference for devices with some color.

But, inasmuch as there is such a wide divergence of opinion on the subject, a number of manufacturers of electrical devices, jobbers, dealers and central stations were questioned as to their experiences in the sale of such appliances having colored handles or attachments, and some of their opinions are set out herewith, to convey an idea as to conditions as they actually exist.

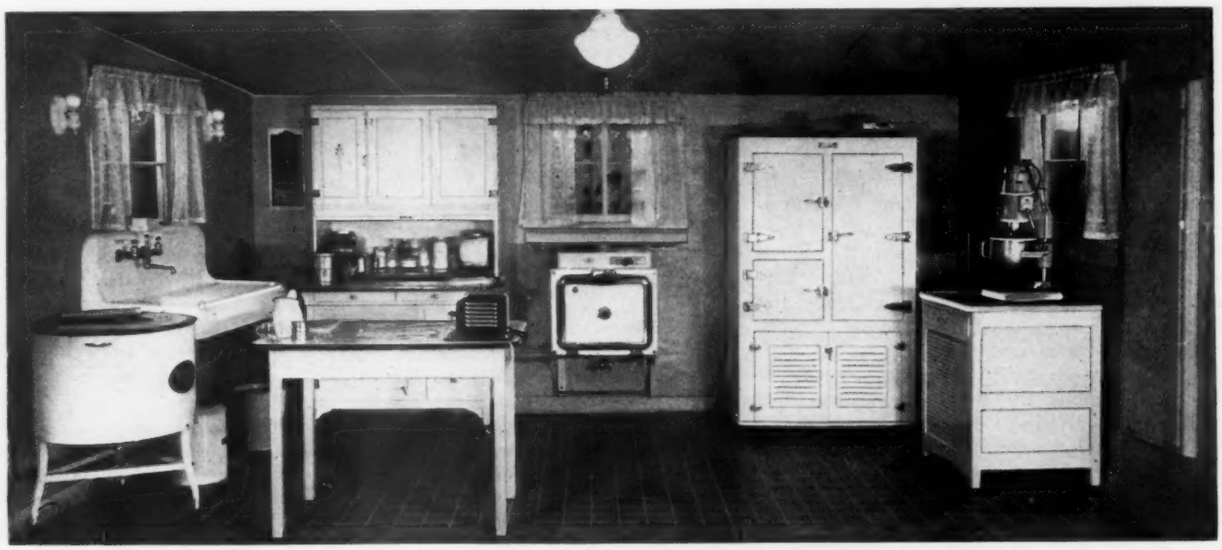
From the standpoint of the manufacturer, one maker of small electrical appliances says, "We can say for irons that colors have stimulated business to a great extent, or rather they have helped considerably in holding up the volume of sales during the dull season.

"Staple merchandise, such as the nickel-plated finish, has been moving fairly good, mostly with conservative customers who are rather slow to grasp new ideas and who do not yet appreciate the value of color in brightening up the home.

"The younger generation, brides and persons purchasing for wedding gifts seem to take to colors. We have found in several instances that attractive colors resulted in sales where the purchasers did not particularly need new irons. On the other hand, we have found that in certain sections the color appeal is still lacking and many people contend that color in the home is more or less of a passing fad that will soon die. Time alone will tell, however, whether this latter opinion is correct, but we believe that the general tendency is toward more cheerful colors, both inside and outside of the home and that it will continue to be popular in the future."

Another manufacturer says, "We have, as have nearly all manufacturers of electrical appliances, experimented with colors such as red, green, blue, orange, light and dark grays and combinations of these several colors, and we find that while the dealers like a variety of colors for window dressing, the housewife, when she buys an ironer or washing machine, prefers either standard washing machine gray, or a neutral green. As a rule the reds, yellows and stronger combinations apparently clash with the more subdued colors in the majority of kitchens and laundries.

"While it is true that color has run riot in this, as well as other industries, we think that sanity is not far off and that soon two or three standard colors will be developed in the industry, or at least should be, to correct some of the abuses of over-stocking and slow-moving of highly colored merchandise."



A typical illustration of a home-like kitchen that would readily lend itself to the use of colors in appliances and appointments. Today, washers, refrigerators, stoves and practically every kind of electrical appliance may be had in a variety of color schemes, all tending to beautify the home and make it, and particularly the kitchen, a more pleasant place in which to live

in the HOME and Its *Effect* of Electrical *Appliances*

dealers and retailers are widely divided in their opinion as to the effect of this movement on the electrical industry, but the majority believe that the trend is but a passing fad

A manufacturer of electric stoves and ranges says, "We made our first colored range in 1921 and have been making them in about the same quantity ever since. The color fad seemed to have quite an impetus in the early part of this year and has resulted in some additional sales in odd colored ranges.

"Our original use of color was solid colors instead of white trimmed with color and we suggested them and recommended them only in cases where complete color schemes in the kitchen were carried out. We have never recommended to our dealers that they stock colored ranges, for we have felt that it would lead to unnecessary inventories and thereby increase the cost of operation, especially at a time when the industry needs to decrease its operating costs. Most of the demand for color-trimmed ranges has gradually decreased, but the demand for ranges for kitchens having color schemes, such as for apartment buildings and large homes has been gradually increasing since we began building colored devices."

With respect to refrigerators one of the largest builders of these devices says, "We entered the refrigeration field just as color was being widely promoted for home equipment. At first we were somewhat concerned as to the demand that might be made upon us for additional stock in various colors, but we have found however, that color is not a factor in selling electric refrigeration, and if the kitchen is in color, the housewife prefers refrigerators in white, since its outstanding feature is sanitation."

Still another manufacturer, who makes percolators, waffle-irons and similar devices says, "We have been furnishing this equipment with colored handles and have found that there is very little demand for them, yet we sell large quantities of the articles with plain black handles."

Further investigation developed that such statements as the foregoing were in accord with the opinions of jobbers of electrical appliances. They say that there is little noticeable increased demand for colored electrical appliances, as compared with those of more conventional styles. They also stated that if they were required to carry colored appliances in stock that it increased their inventories materially, and with some devices as much as four times the usual amount of stock. In this manner it worked a hardship on them, because of the necessity for more storage space, larger inventories, greater cost of handling more merchandise and the increased cost of operation in general, with practically no increase in sales volume.

Dealers and retailers of electrical appliances concur with the jobbers, in that the use of color in appliances makes it necessary for them to carry much larger stocks of merchandise in order that they may exhibit or display such devices in all the colors in which they are made. This, as was the case with jobbers, increased the cost of operation, with but little increase in sales volume.

In fact one of the largest central station dealers in New York City explained that insofar as he had observed there was little demand for colored appliances. He stated that his organization still disposed of about the same number of appliances and that black sold as well as any other color. He gave as a reason for this the fact that the conservative housewife hesitates before buying colored appliances, knowing full well that sooner or later she will want to alter the color scheme in her kitchen. This being the case, and if her kitchen were finished in one color scheme, with electrical appliances and kitchen utensils to harmonize, these would be useless if she were to change the color of her kitchen to some other combination.

The retail refrigerator department of this same organization handles about nine different makes of electrical refrigerators, many of them in colors or combinations of different colors, and it has been found that there is still the usual and steady demand for white, rather than color. This being the case, this organization is materially reducing its stock of colored refrigerators, because there is little demand for them. In fact it was stated that about 90 per cent of the total sales were all white or combinations of white boxes with colored trim.

In the retail department stores it was found that about the same conditions existed. They too carried large stocks of colored appliances and some of them have arranged model kitchens in different color schemes to augment the sale of colored appliances and utensils. But the trend of opinion is that while the housewife might purchase kitchenware in colors, because it is comparatively inexpensive, she was more conservative about buying electrical devices in any color except the more conventional patterns. Another reason advanced for this was that while a percolator or waffle iron with red handles might fit into the kitchen color scheme it would not be so fitting in a dining room, where many of them are used.

The use of color should also be considered from the standpoint of simplification and standardization. In discussing this phase of the subject in a recent report of the Department of Commerce, Edwin W. Ely, Chief of the Division of Simplified Practice, points out that "simplified practice means the reduction of variety in sizes, dimensions, and immaterial differences, as a means for eliminating waste, decreasing costs, and increasing profits and values in production, distribution and consumption. Differences in color, as applied to a commodity, are an immaterial or a material consideration according to the viewpoint from

(*Continued on page* 154)

Statistics Aid in Lowering

Most electrical manufac distribution in the details reasons for this excessive determined by careful

DISTRIBUTION costs have not only gone up tremendously in recent years, but, worse than that, they are still going up. Before the War, the average manufacturer, including those in the electrical business, could figure on getting close to sixty cents of every dollar the consumer paid for his goods. Today he cannot figure on getting more than forty cents of the consumer's dollar. The difference has been absorbed by the rising cost of selling.

MANUFACTURERS of electrical products, in common with manufacturers in numerous other lines, are complaining about the high cost of distribution. It costs them too much to sell. It costs them too large a proportion of the dollar they get from their customers to move their goods from the factory to the user.

Distribution costs have not only gone up tremendously in recent years, but, worse than that, they are still going up. Before the War, the average manufacturer, including those in the electrical business, could figure on getting close to sixty cents of every dollar the consumer paid for his goods. Today he can't figure on getting much more than forty cents of the consumer's dollar. The difference has been absorbed by the rising cost of selling.

¶ It is by looking at the facts that can be dug up from under his routine accounting figures that a manufacturer can arrive at the secret of his high distribution costs.

THESE facts are fairly familiar to all. Electrical manufacturers have been struggling with them for at least ten years. The puzzle in the situation is not the existence of the facts, but rather as to what can be done about them.

It would require a much nervier person than I to offer any pat solution of the problem of the high cost of selling. This problem is highly complicated. Numerous causes enter into it. There is no cure-all that will solve it, but certainly there are remedies that will alleviate its seriousness. I have run across several of these remedies in my work as a sales consultant. Since several of these remedies were discovered in the electrical industry, a recount of them may be helpful to other electrical manufacturers who are burdened with excessive selling costs.

In my line of work, the first thing that is usually done when we go on a job is to make out a questionnaire. This questionnaire may contain several hundred questions.

Many of these questions may seem to be both silly and impertinent, but they all have their purpose. They are deliberately designed to bring out certain detailed facts about the business under scrutiny. Nine times out of ten the management regards a large proportion of the facts asked for as being unimportant and irrelevant. Most companies are unable to answer a goodly percentage of the queries. The fact that they cannot answer them is highly significant, as the subsequent analysis nearly always reveals For instance, it is invariably discovered that manufacturers have a tendency to generalize about their affairs. They will tell you that their business is profitable or unprofitable, that their selling costs are low or high, that they have enough salesmen or they haven't, that their branch offices make money or they don't, etc.

Now these answers may be true enough. A manufacturer knows or at least has a pretty strong opinion on such questions as to whether his business is profitable or not. But the trouble with such answers is that they are indefinite, and at best are misleading. Even when a manufacturer tells the amount of his net profits and what percentage it represents on his sales and his invested capital, he has not told enough.

Closer analysis will usually reveal an interesting story behind those profit figures. As a rule, it will be found that no business is uniformly profitable or unprofitable. It may be profitable, as a whole, but certain territories, products or departments are likely to be operating in red and thus pull down the average profits of the organization. Likewise a company, as a whole, may not be making any money and at the same time have several products, departments or markets that are big revenue producers.

It is by looking at the facts that can often be dug up from under his routine accounting figures that a manufacturer can arrive at the secret of his high distribution costs. The way to find these illuminating facts is to stop viewing a business as an integer and to get into the habit of taking it apart and of examining it section by section. Any manufacturer who does this systematically is bound to improve the results of his management.

The questionnaire to which I have alluded ordinarily proves the necessity for such analysis. However, the analysis, itself, is not something that should be done occasionally by an outside consultant. Rather is it something that should be done regularly by a trained statistician in the full-time employ of the company.

¶ The way to find facts relative to high distribution costs is to stop viewing a business as an integer and then get into the habit of taking it apart and examining it.

NEARLY all well organized companies gather a mass of statistics, but as a rule they do nothing about them. It is no one's job in the average organization to interpret these statistics for the guidance of the management. In the majority of firms there isn't any one capable of interpreting them. It is not a task for an auditor or an engineer or a sales executive. In fact, to do this work properly a man should be a combination auditor-engineer-salesman. They are called sales statisticians, but that title does not come within a mile of describing the multifarious character of their work. The best way to give an idea of what they do is to relate a few incidents.

The sales statistician is a new profession. There are only a few dozen of them in existence. That several of them are connected with electrical businesses speaks well

Manufacturers' Selling Costs

turers run up the cost of of their selling. The selling cost can readily be analysis of sales statistics

By John Allen Murphy
Marketing Counsellor

SALES statisticians spend their time juggling, comparing, and dissecting figures. They usually set up a series of hypothetical questions and then proceed to answer them statistically.

A certain manufacturer of a small line of electrical devices regarded his selling costs as entirely too high. Try as he would he could not find the reason. Finally he engaged a sales statistician to study the problem. The first thing this man did was to ask the following questions:

1. **What is the company's selling cost?**
2. **What is the cost on each product?**
3. **What is the cost of each salesman?**
4. **What is the selling cost in each territory?**
5. **What is the cost of each branch office?**
6. **What does it cost to get business from the average large account?**
7. **What does it cost to sell the average small account?**
8. **What is the selling cost by seasons? By months?**

And so, after many other questions of this type had been asked and answered, it was found that two of the company's branch offices were responsible for the high selling costs.

for the enterprise of this industry. In fact, there is a company in this field—the Hoover Company—that has carried further the art of interpreting and applying sales statistics than any other organization in any field.

These statisticians spend their time juggling, comparing, dissecting figures. They usually set up a series of hypothetical questions and then proceed to answer them statistically. A certain manufacturer of a small line of electrical devices regarded his selling costs as entirely too high. Try as he would, however, he could not find the reason. Finally he engaged a sales statistician to study the problem.

The first thing this man did was to ask the following series of questions:

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What is the cost on each product?
What is the cost of each salesman?
What is the selling cost in each territory?
What is the cost of each branch office?
What does it cost to get business from the average large account?
What does it cost to sell the average small account?
What is the selling cost in New England? In the South? In the Midwest? In the Pacific Northwest? In the Pacific Southwest? In each State?
What is the selling cost by seasons? By months?

¶ Nearly all well organized companies gather a mass of statistics, but as a rule they do nothing with them. It is one man's job to interpret such data.

NUMEROUS other questions of that type were asked. When the statistician worked out the answers to them, he had the solution of the problem. It was found that two of the company's branches were responsible for the high selling costs. These offices had, heretofore, not been suspected because the company had been getting its largest volume of business from these territories. It was assumed that the selling expense in these offices must have averaged lower than anywhere else in the domestic market.

Anyway, the analysis revealed just the opposite condition to exist. The percentage of selling cost in one of these offices ran three times what the national percentage was. The other office ran about two-and-a-half higher.

The managers of both these offices were remarkable salesmen. They, themselves, were getting practically all the business. Their men were loafing on the job. It was costing some of these men 500, 600, and in one case 900 per cent to sell goods. In other words, it cost in these instances, from $500 to $900 to sell a machine for which the company got $100.

The managers were salesmen, not executives. They knew their offices were getting a tremendous volume of business, so paid no attention to the selling costs of individual salesmen. When these managers were given full-time selling jobs and real executives were appointed to succeed them as managers, the selling costs of this company, as a whole, dropped eight per cent.

If you think this is an extreme case, ask almost any manufacturer who has a lot of salesmen or branch offices or other complications in his business. A lack of selling balance between salesmen, territories, products, markets or seasons, is one of the most common causes of the high cost of distribution.

Take the matter of seasons. I know of a number of electrical manufacturers who throw away during the off-seasons the money that they made during the industry's flush months. This is a difficult problem to handle. About the only way it can be overcome is to broaden the line so that there will be something in it that will be in demand at all times of the year. Landers, Frary & Clark, for example, have a line that is so broad that at least a few numbers in it sell every week in the year.

Seasonal fluctuations affect the electrical manufacturer in more than one way. Many appliance manufacturers, for example, have two good seasons each year—in the fall and spring. The rest of the time their sales are sluggish. Because of this condition a number of the concerns in the field have difficulty keeping salesmen. Since the men

work on a commission, without a drawing account, they are not able to finance themselves during dull months.

A sales statistician got to work on this problem. He soon discovered that the salesmen working for his company averaged $2,444 a year. This figured $47 a week for fifty-two weeks—an excellent income for men engaged in this line of activity. However, the men made about 85 per cent of the $2,444 in six months of the year. The trouble was that during the flush period of the calendar the men lived at the rate of $90 a week, or about twice their average weekly income for the year. Thus, when sales began to drop and their income was cut down to almost nothing, the men had no savings to fall back on.

¶ Some of the best work done by sales statisticians is in the working out laws of averages that can be used in the formation of standard practices.

THE company concluded that human nature being what it is, that there was little likelihood of being able to get the men to save for the rainy season. So the company devised a plan whereby a salesman draws only half his commission during the week he earns it. The other half is put in an interest-bearing fund and is paid to the salesman in weekly installments during the six dull months.

By reason of this plan a salesman's income is likely to be larger during the slack period. Let us suppose a man's commissions average $100 a week during the busy six months. He draws $50 on account each week. The remaining $50 is paid to him weekly during the off-season. In addition, he is likely to earn something during this dull period. His commission during this time may be $10 a week. This is paid immediately, thus bringing his poor-season salary up to $60 a week.

The psychology of this plan is splendid. It has made this manufacturer's sales force one of the most stable in the entire industry.

It often requires a lot of statistical digging to locate the cause of the high cost of selling. It does not reveal itself on the surface. That was the experience of the maker of a piece of electrical apparatus. This manufacturer's product is used by other manufacturers in all sorts of lines, and it is also used by electrical contractors. Theoretically, this product has an endless market. For some reason, though, the company making this particular article appeared to be attaining only a small portion of its possibilities. Selling costs were high—much higher than competitors.

About a month after a sales analyst was put on the job he ran into a condition that made him pause. He discovered that his employers were selling their product through wholesalers who were given exclusive agencies. There was nothing particularly unusual about this arrangement, but the investigator was impressed by the fact that the distributors had especially large territories. There were only about fifteen distributors in the entire country.

These distributors had a fine sale on the product. But even the wholesalers themselves admitted, when the investigators approaced them, that their territories were too large. They could not even begin to cover the prospects that had been assigned to them.

Hence the distributors gladly assented to a plan to have their territories drastically curtailed. The number of distributors was increased to eighty. Each distributor was still given an exclusive arrangement, but he was not assigned more ground than he could handle comfortably.

The interesting thing about this new plan is not that it doubled the manufacturer's total business, but that it *more than tripled* the sales of the fifteen original distributors. The explanation is that with less territory to ramble over, these distributors devoted more time to selling and less to traveling, and were able to work so much more intensively that they naturally had to sell more. Today, this electrical manufacturer proudly points to the fact that his selling costs are at least 30 per cent under his competitors.

Most electrical manufacturers run up the cost of their distribution in the details of their selling. Their salesmen do not put in enough hours a day. They do not make enough calls, or too few of their calls result in demonstrations, or not enough of them are converted into sales.

Some of the best work being done by sales statisticians is in working out laws of averages that can be used in the formation of standard practices for the sales department. For instance, an analysis made over a long term of years might show that the most successful appliance salesmen average thirty calls a day. Hence, if a salesman is not making thirty calls a day it is easy to prove to him that he is not making the money that he might be making.

Further analysis may reveal that good salesmen average one demonstration out of every five calls. They also average one sale on every three demonstrations.

If any salesman is not doing as well as the average, it means that he is not approaching his prospects properly and that his demonstrations are weak. In that case a sales supervisor or the retail dealer in that district accompanies the salesman on his rounds for a day or two. He "stands by" while the salesman does his stuff and studies his faults, just as the golf professional analyzes the mistakes that his pupils are making. After the call has been made, the supervisor tells the salesman where he is "falling down." Occasionally the supervisor himself takes a hand in the selling and shows the salesman how to do it.

¶ A lack of selling balance as between salesmen, territories, products, markets and seasons is one of the most common causes of the high cost of distribution.

A THOUSAND and one other helpful facts about selling are constantly being unearthed by these statistical sharks. They stick their noses into every nook and cranny of a business, and likely as not come out with useful information.

For example, the sales manager of a big electrical appliance manufacturer was making the rounds of his district offices. "Your sales are running below your quota," he tells one of his district managers. "I know it," replies the latter. "But what can I do about it?"

"How many salesmen have you?" asks the sales manager.

"Seventeen."

"Not enough," responds the sales executive. "Our experience throughout the nation shows that you need twenty-eight men to attain a quota as large as yours."

"I know I ought to have more men, but I have been unable to get them," apologizes the district chief.

"You haven't seen enough applicants," explains the visitor. "You can get only one salesman out of each eight applicants you examine. To get eleven more men you must examine at least eighty-eight applicants. No use of getting discouraged before you have done that."

And thus are the executives who are connected with these statistically-prepared houses loaded for any problem that may arise.

After all, what these electrical manufacturers are doing is no different from what farmers are doing. The up-to-date farmer tests his cows for efficiency. The cow that is a poor milker or whose milk is low in butter fat is sent to the slaughter house. Likewise the poultryman eliminates the poor layers from his flock. It is the poor milkers and the poor layers that run up the cost of dairying and the chicken business, just as it is the poor salesman that runs up the electrical manufacturer's cost of distribution.

The SUCCESS OF INDUSTRIAL HEAT *is in the* CONTROL

An explanation of some interesting applications of industrial heating equipment and control apparatus with a brief discussion of its advantages in manufacturing and other industrial plants

In connection with a brief discussion of industrial heating, H. E. Searbrough, of the General Electric Co., and author of the accompanying article, says that contrary to general opinion, electricity is not usually out of the question for heating applications, and in many instances will largely eliminate handling, rejections, spoilage and unnecessary labor.

As a means for showing the wide range of application of electrical heating equipment in manufacturing plants several of the different types of furnaces and control apparatus are shown and described in the following pages, as well as in the accompanying article.

THE EDITOR

A LARGE number of very interesting industrial heating applications have been made in the Central West within the past few years. The success of these installations has been largely dependent upon the successful operation of automatic control equipment operating in conjunction with sensitive automatic temperature control instruments. Manufacturers of equipment requiring heat treating operations have come to realize the importance of automatic control in connection with the time of operation and temperatures involved.

Electric heating equipment lends itself admirably to the use of automatic control panels in conjunction with temperature control instruments. It is far easier to control electric furnaces by this means than it is, fuel furnaces. Most fuel furnaces are automatically controlled by governing the supply of fuel with solenoid-operated valves. Only a portion of the fuel is controlled with the valves through a by-pass, and in operating furnaces in this manner, it is necessary to adjust the automatic control system for practically all variations in load conditions. This is entirely eliminated with electric heating equipment.

Temperature control instruments of various designs have been on the market for a number of years and there are several makes which have been very successful. The application of these control instruments to electric heating apparatus through contactor and relay panels was at first more or less difficult because the control instrument would handle a very small amount of current only. It was difficult to get good relays that would operate satisfactorily without having any excess current through the relay circuit. A relay by means of which all circuits are broken by the relay and not by the control instrument, is now available, however. The amount of current handled by this relay, and incidentally the control instrument, is very small. With this new relay the external resistance is of such a value as to limit the holding current of the relay to something less than half an ampere. This is in view of the fact that nearly all existing temperature controllers and recorders, both pyrometric and thermometric, are rated at a maximum of one half ampere carrying capacity.

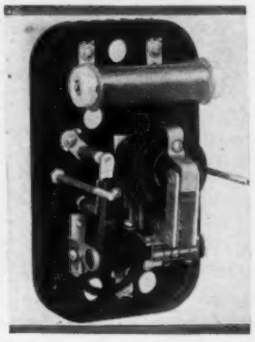


Figure 1. A heat control relay with the external resistance mounted on the base of the relay at the top

By means of an external resistance mounted on this relay, the holding coil is shorted allowing the relay to drop out; thus the control instrument does not break the current-carrying circuit. When the contactor is to be reclosed because of a temperature drop in the heating equipment, the instrument makes contact, the relay closes the contactor coil circuit and the power is again thrown on the equipment. Using this equipment for control, a temperature control instrument will give no trouble whatsoever from the burning of contacts or overheating of the current-carrying parts. Such a relay is shown in Figure 1 with the external resistance mounted on the relay base.

A large number of furnaces have been installed for heat treating, vitreous enameling, melting all kinds of gray metal such as babbitt, tin, type metal, etc., and for heating large galvanizing kettles.

Figure 10 shows an automatic control panel and temperature control instruments for a large steel casting annealing furnace. The furnace, shown in Figure 14, is controlled at two different places, one section of heating units being controlled with one panel and the other section being controlled by the other panel. Each section, by means of a triple-pole, double-throw switch, can have the heating units changed from Y to delta connection and thereby obtain variable inputs to the furnace for variable rates of heating or load conditions.

Figure 4 shows a battery of three box-type furnaces installed at the plant of the Ross Gear and Tool Company, at Lafayette, Indiana—large manufacturers of steering gears for the automobile trade. These furnaces are 18 in. wide by 36 in. deep by 18 in. high. This company has four of these furnaces and also one furnace 24 in. wide by 54 in. deep by 20 in. high, and one air-drawing oven. The air-drawing oven is 20 in. deep by 24 in. wide by 12 in. high. All of this equipment has automatic temperature control, some of which can be seen in the illustrations.

The importance of very accurate temperature control in the heat treatment of automobile steering-gear parts can very readily be appreciated. With the automobile manufacturer increasing each year the maximum speed of his

cars, it can be seen that the stresses and strains developed on steering-gear parts are becoming more severe. The safety of an automobile is dependent upon the steering mechanism. If one of the small parts of the steering gear were to break with the car running at a rate of 50 or 60 miles an hour, a serious accident might result.

An installation of an elevator-type annealing furnace with automatic temperature control is shown in Figure 11. This installation is at the plant of the Century Electric Company, St. Louis, and is used for annealing punchings used in the manufacture of small motors. The furnace and equipment were installed by the Gas-Equipment Engineering Corporation of Philadelphia, Pa.

Figure 2. The heat control equipment for the stereotype melting furnaces shown in Figure 5 in the plant of the Chicago Daily News

A number of such furnaces are used in General Electric plants and in such electrical manufacturers' plants as the Maloney Electric Co., St. Louis; the Brown-Boveri Company at Camden, N. J., and the Packard Transformer Company.

The Sangamo Electric Company at Springfield, Ill., recently installed a 70-kilowatt, rotary-hearth type, heat-treating furnace for hardening meter magnets. The furnace is controlled in two sections, one controller operating on the in-going section and another controller on the out-going section of the furnace.

Figure 9 shows a typical installation of rotary type furnace using two control zones. The control panel and equipment are shown in the center of the illustration at the right of the furnace. The company using this furnace has installed about twenty electric furnaces in the past two years. These furnaces are used for hardening, annealing, drawing and carburizing steel forgings for the manufacture of tractors.

Another very interesting installation of rotary-hearth heat-treating furnaces is shown in Figure 3. The control equipment is shown in Figure 6. One furnace is used for heating crank shafts at 1600 degrees F. prior to quenching. The other is used for drawing crank shafts at 1200 degrees after the hardening operation. These two furnaces have been operating for about three years in a very satisfactory manner and the results obtained have been very accurate.

The Baker-Perkins Company at Saginaw, Mich., some time ago installed two 29-kilowatt, box-type, heat-treating furnaces and this installation is shown in Figure 7. The control equipment may be seen in the center of the picture between the two furnaces. It is interesting to note that these two furnaces are operated by an automatic time switch so that the power can be thrown on and off the furnaces each day automatically. A very similar installation was recently made at the Ramapo-Ajax Corporation of Chicago, where two 45-kilowatt furnaces were installed for heat treating rail clamps. Time switches were installed with the automatic control equipment by means of which furnaces were automatically thrown on and off the line and the owner was thus enabled to obtain two more heats a day of twenty-four hours than had been possible with the old oil-fired furnaces. The present method of operation is for the operator to load the furnace the last thing before going home in the afternoon; the time switch throws the power on early in the morning and, when the operator comes in, the charge is ready to be quenched. It is taken out, quenched and recharged and the operation is repeated the following night. In this manner it was possible to get the increased production and, for this reason, the furnaces were found to operate much more economically than the old fuel-fired furnaces which two new furnaces replace.

In manufacture of kitchen ware, sanitary ware, cook stoves, electric ranges and other types of equipment requiring the use of vitreous enameled parts, electric furnaces with automatic control have been found to be very highly suitable. Figure 8 shows the installation of a small box-type enameling furnace and an automatic control panel may be seen at the right of the furnace. This furnace is used for firing enamel on sanitary meat market scale parts and was installed about five years ago. In this particular installation the reduction in rejections saved the user almost enough to pay for the cost of the current used in operating the furnace.

It has also been found that the control of the temperature in melting pots for babbitt bearings is a very important item. Figure 12 shows the installation of two such melting pots installed at the Yellow Sleeve Valve Engine Works at East Moline, Ill.

Another heating application which has been very successful in a large number of installations made recently is the melting of stereotype metal in newspaper plants. Figure 5 shows the installation of an 8-ton metal furnace at the Chicago *Daily News*. A duplicate of this equipment is installed in one of the other Chicago plants of this newspaper. The control equipment for this melting furnace is shown in Figure 2.

Similar installations have been made near Chicago and several of the larger newspapers are now considering the complete electrification of their stereotype foundries. Some idea of the size of some of this equipment is shown by the fact that, in larger newspapers as much as 125 or 150 tons of stereotype metal are melted in twenty-four hours and the connected load in heating, and control equipment is from

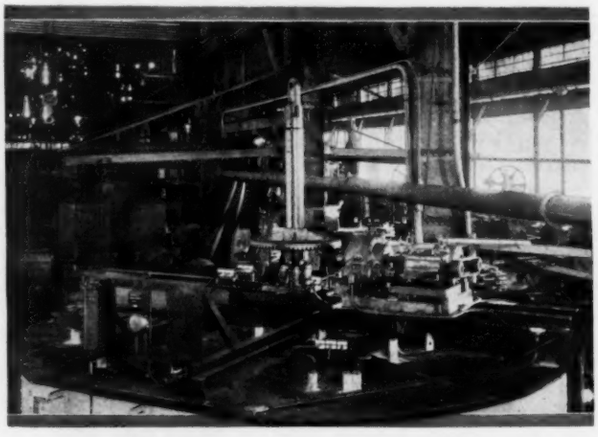
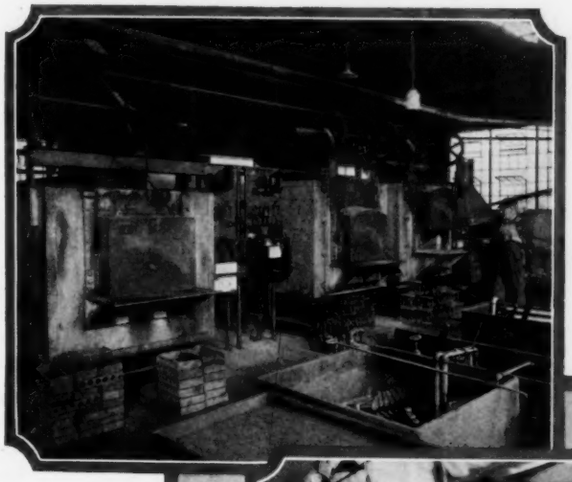


Figure 3. An installation of rotary hearth heat-treating furnaces used for drawing automobile crankshafts at 1200 and 1600 deg., after the hardening operations. The control equipment for this apparatus is shown in Figure 6

1200 to 2000 kilowatts, depending upon the rate of melting and the tonnage desired.

Contrary to the general belief, electricity is not usually out of the question for heating applications. In many applications, it is found that the actual cost of current for electric heat is less than the cost of fuel with the old process.

Industrial Electric Heating Equipment Reduces Waste



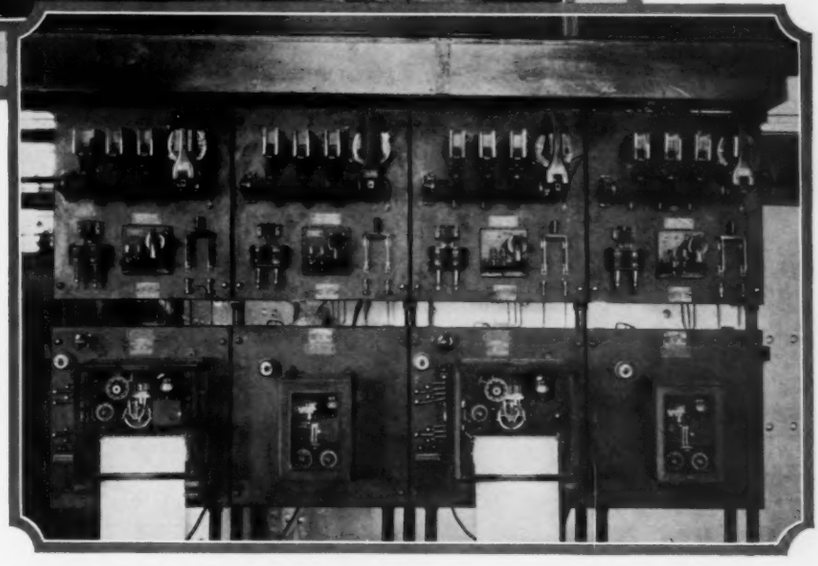
THIS and the following pages show some typical examples of industrial electric heating installations and their control apparatus. Such equipment, the author of the preceding article says, is a material factor in reducing labor and handling expense, waste and spoilage, and heating costs. At the same time it makes for greater production and larger profits in the manufacturing plants in which it is in use, because industrial electric heating furnaces have greater capacity and are automatically controlled

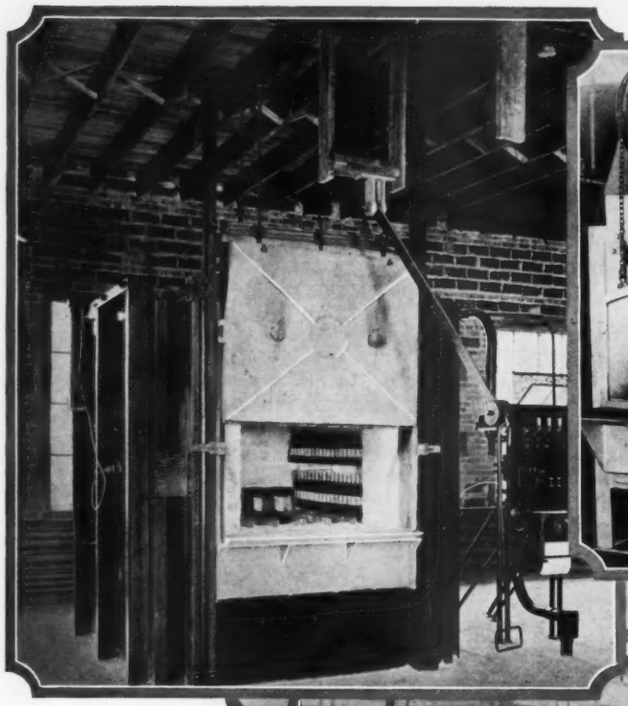
FIGURE 4, above, is a view of three 18-27-kw., 220-volt, single-phase, 60-cycle heat-treating furnaces in the Ross Gear & Tool Company plant at Lafayette, Ind. They are used for heat treating automobile steering gear parts

At the right, Figure 5, shows the control panels of an eight-ton electric furnace installed in the printing plant of the Chicago Daily News, where it is used for melting stereotype metals

IN Figure 6, below, is shown a view of a control panel for two 150-kw. rotary furnaces used for heat treating, hardening and drawing crankshafts. Many installations like this are in general use in automobile plants, where they are used for any number of similar operations in the making of all manner of parts for motor cars

ELECTRIC heating equipment in industrial plants lends itself admirably to the use of automatic control panels. It is far easier to control electric furnaces by this means than it is fuel furnaces. Most fuel furnaces are automatically controlled by governing the supply of fuel through a by-pass valve, and in operating furnaces in this manner it is necessary to adjust the control for practically all variations in load conditions. This is entirely eliminated with industrial electric heating equipment





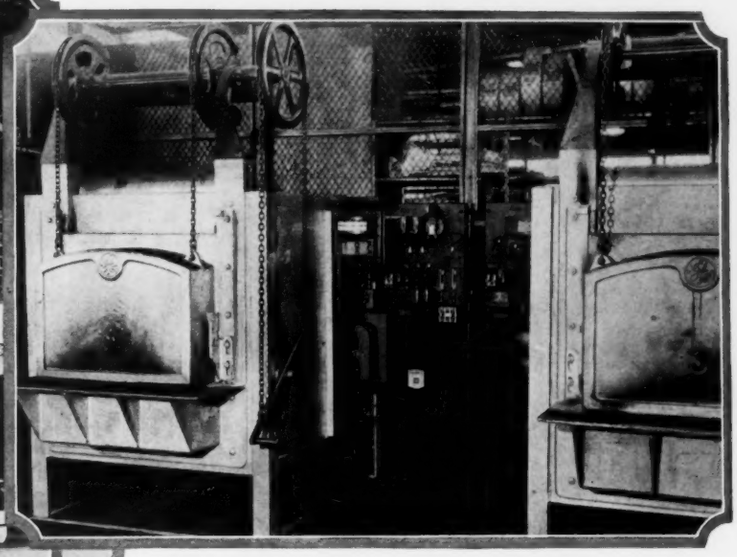
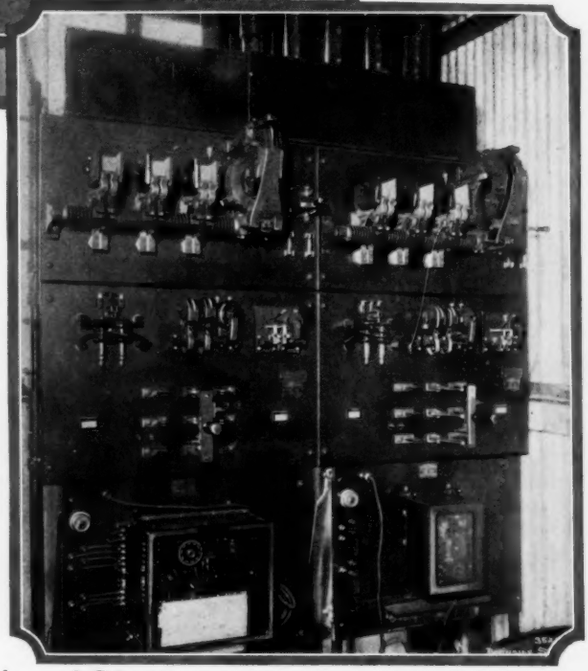


FIGURE 7, above, shows two direct heat electric furnaces installed in the Baker-Perkins Company plant at Saginaw, Mich. They are automatically controlled and are also fitted with time switches, so that the heat may be thrown on or off at any specified time

FIGURE 8, above, is a view of an electric heating furnace in use in the plant of the Sanitary Scale Co., Chicago, where it is used principally for the puprose of enameling scale parts

Figure 9, at the right, shows a rotary hardening furnace placed directly in the line of production in the plant of the Caterpillar Tractor Co., Peoria, Ill., where it is used for annealing gear blanks

Figure 10, below, is an illustration of the two-section automatic control panel used with elevator type heating furnaces. With this equipment the furnace may be controlled from two different stations or operating points



A LARGE number of very interesting industrial heating applications have been made in the central west within the past few years. The success of these installations has been largely dependent upon the successful operation of automatic control equipment working in conjunction with sensitive automatic temperature control instruments. Manufacturers of materials and products requiring heat treating or annealing operations have come to realize the importance of automatic control in connection with the time of operation and the temperatures involved. The importance of very accurate temperature control in the heat treatment of automobile steering gear parts, for example, can readily be appreciated. With the manufacturer ever increasing the speeds of automobiles it can be seen that the stresses and strains developed in steering gear parts are becoming more and more severe. For this reason many such manufacturers are now using electric heating equipment automatically controlled

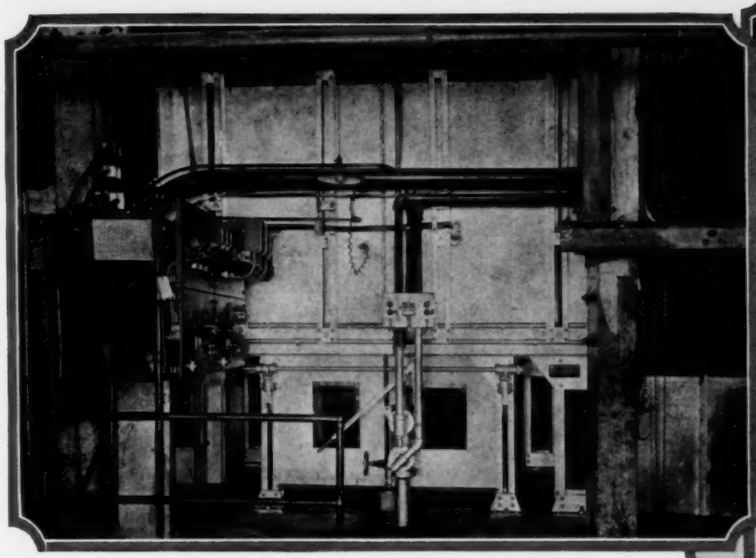
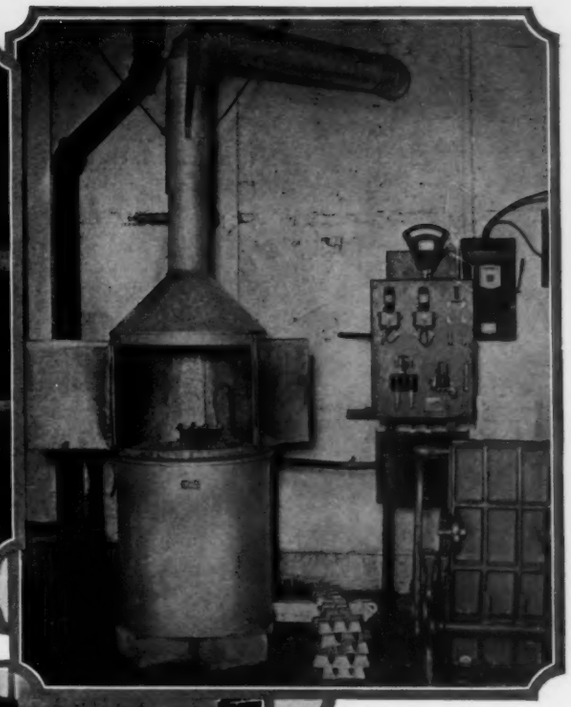


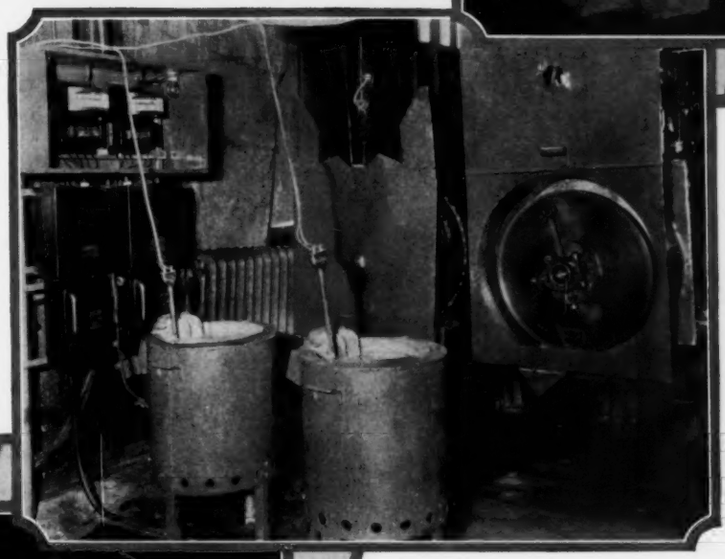
FIGURE 11, above, is a view of an electric elevator type annealing furnace installed in the plant of the Century Electric Co., of St. Louis, where it is used for heat treating and other similar annealing operations in the production of small electric motors

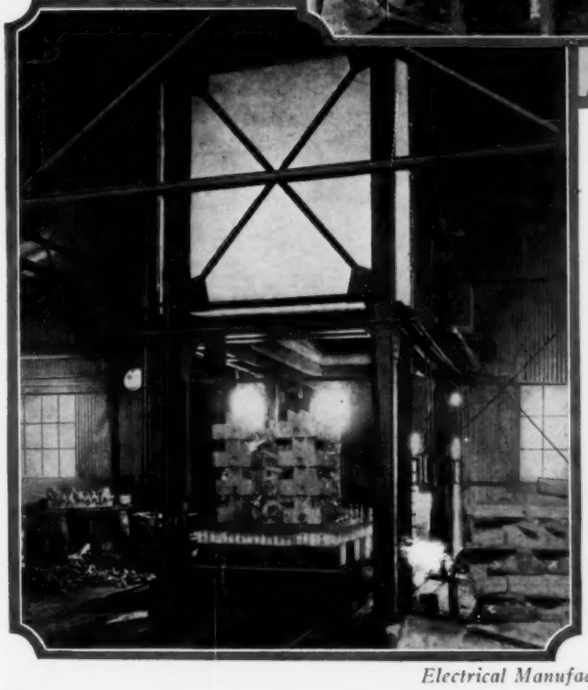
At the right, in Figure 12, may be seen an installation of two melting furnaces as they are used in the plant of the Yellow Sleeve Valve Engine Works, East Moline, Ill., for melting tin and babbitt for use in main bearings in automobile engine connecting rods



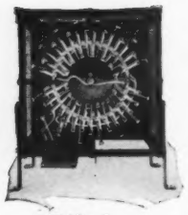
ABOVE, Figure 13, is a view of a metal melting pot, electrically heated, as it is used in the printing plant of the Detroit Times for pig and flat work casting in the production of linotype metal for pigs for the type setting machines.

At the left, below, in Figure 14, is an electric annealing furnace of the elevator type used for annealing castings at 1650 deg. F. in the plant of the Burnside Steel Company at Chicago. Its inside dimensions are 11 ft. long by 4 ft. 3 in. wide



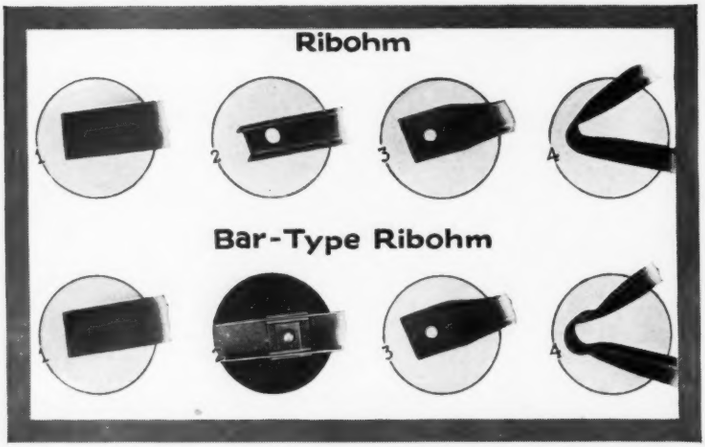


IN the manufacture of kitchen ware, stoves, electric ranges and other types of equipment requiring the use of vitreous enameled parts electric furnaces have been found to be very suitable. Likewise it has been found that it is highly essential to control the temperatures of melting pots for babbitt bearings, and so it is in printing and newspaper plants where large quantities of type metal are to be melted daily. Some idea as to the size of equipment for this purpose may be had when it is known that as much as 125 to 150 tons of stereotype metal are melted in 24 hours, requiring a connected load in heating and control equipment from 1200 to 2000 kilowatts, all depending upon the rate of melting and the tonnage required. Many other similar illustrations of the wide general use of electric heating may be drawn from industries of all kinds, and it should be understood that electric furnaces may be had in all sizes with or without automatic control from the small melting pot to those handling tons of materials daily



Ribohm

1. A metal ribbon of appropriate size and alloy.
2. Is punched and formed into a "U" shaped channel and
3. After flattening at the ends and center
4. Is bent into a "V" shape, forming a complete resistive element, several of which make up the complete rheostat illustrated above.



Bar-Type Ribohm

1. A metal ribbon of appropriate size and alloy
2. Is punched and formed into a "U" shaped channel with provision for mounting and extra terminals and,
3. After flattening at the ends,
4. Is formed with specially shaped bends into a continuous resistive element, as illustrated above.

Standard and Bar-Type Ribohm Resistors

IF YOU manufacture electrical control equipment employing large current capacity resistors and rheostats, Ribohm should be considered.

Ribohm is a patented resistive element made only by the Ward Leonard Electric Co. It was developed to take the place of bulky or heavy, or fragile resistors, such as cast iron grids, in heavy duty circuits.

Seven years of actual service in the field have proved the superiority of Ribohm Resistors in a great many applications now using resistors of other types. The advantages and limitations of Ribohm are known to us. Your engineering department will find ours ready to cooperate in determining the best application of Ribohm to your apparatus.

* * *

Ribohm Resistors are made in two forms which are identical electrically: (1) Standard Ribohm consists of individual "V" shaped resistors which are mounted in groups upon a suitable panel or base. This

Electric
Control Equipment
WARD LEONARD ELECTRIC CO.
Mount Vernon
New York

assembly frequently eliminates all internal wiring back of the panel. (2) Bar-Type Ribohm is a continuous element from terminal to terminal, except where tapered resistance is required. The continuous element eliminates entirely, all contact resistance.

Both types of Ribohm are made of a special metal ribbon of appropriate size and alloy, formed into a "U" channel for structural strength, and then bent into the proper shape for mounting. The cross section of the formed element is uniform, thus eliminating "current crowding" and consequent non-uniform heating. The channel shape, and special form of the bends, gives an element which is light, rigid, strong, and entirely self-supporting, even under exacting operating conditions.

The method of mounting and shape of the bends permits expansion and contraction without stress to either the resistive element or mechanical support. The little mass and great structural strength of Ribohm makes it the ideal unit for use where excessive vibration exists.

Unlike cast grids and other types of resistors, Ribohm resists corrosive action by moisture and atmospheric gases.

Weight for weight, Ribohm will dissipate more energy continuously than any other resistor of the same rating, and will occupy less volume in meeting this condition.

The weight of a Ribohm element is approximately 10% of a cast grid of the same rating. The complete Ribohm assembly weighs from 25% to 33% of an equivalent cast grid assembly. It is lighter than ANY other resistor of the same rating.

You will find Ward Leonard ready to work with you on the application of Ribohm to your control. Ask for a representative to call, or we shall gladly send you Bulletins on the subject.

WARD LEONARD ELECTRIC CONTROLLING DEVICES

Applying Insulating Materials to Coils and Windings

No. 5 of a Series on Insulating Varnishes and Impregnating Compounds

A discussion of the vacuum process for impregnating coils with either solid or liquid compounds to insure complete filling of all interstices

By D. H. Braymer
Consulting Engineering Editor,
Electrical Manufacturing

AND

A. C. Roe
Renewal Parts Engineering Department,
Westinghouse Electric & Mfg. Co.

In the sections of this article which have appeared previously in Electrical Manufacturing, details have been given relative to the application of insulating varnishes to coils and windings by the dipping and baking process, since this is the most generally used method for coils of small size. However, when coils are of large cross section or so insulated with insulating papers, cambric or tapes that it is difficult to secure the desired varnish or compound insulation by the dipping and baking process, then the best results can be obtained by the so-called vacuum pressure impregnation process, which employs two or more closed tanks designed to create heat and vacuum, or high pressure as desired.

Both solid and liquid compounds may be used in this process. When the solid compounds are used, they must be liquefied by heat. Solid compounds are used in order to completely fill all of the pores in the coil or winding. Liquid compounds can usually be used cold, and thus prevent the evaporation of their solvents. The vacuum process when using the liquid compounds, simply gives a more perfect coating to the individual conductors or parts of a winding than the dipping process when the individual conductors are closely bound together.

The main feature of the vacuum impregnation process is the withdrawal of the pocketed air from the pores of the winding or coil, so as to permit the insulating varnish or compound to get into these places and to facilitate the proper drying of the insulating material.

In the following, brief details are given for the application of insulating varnishes and compounds by the use of the vacuum pressure impregnation process. Figure 1 shows large impregnating tanks for handling large coils and wind-

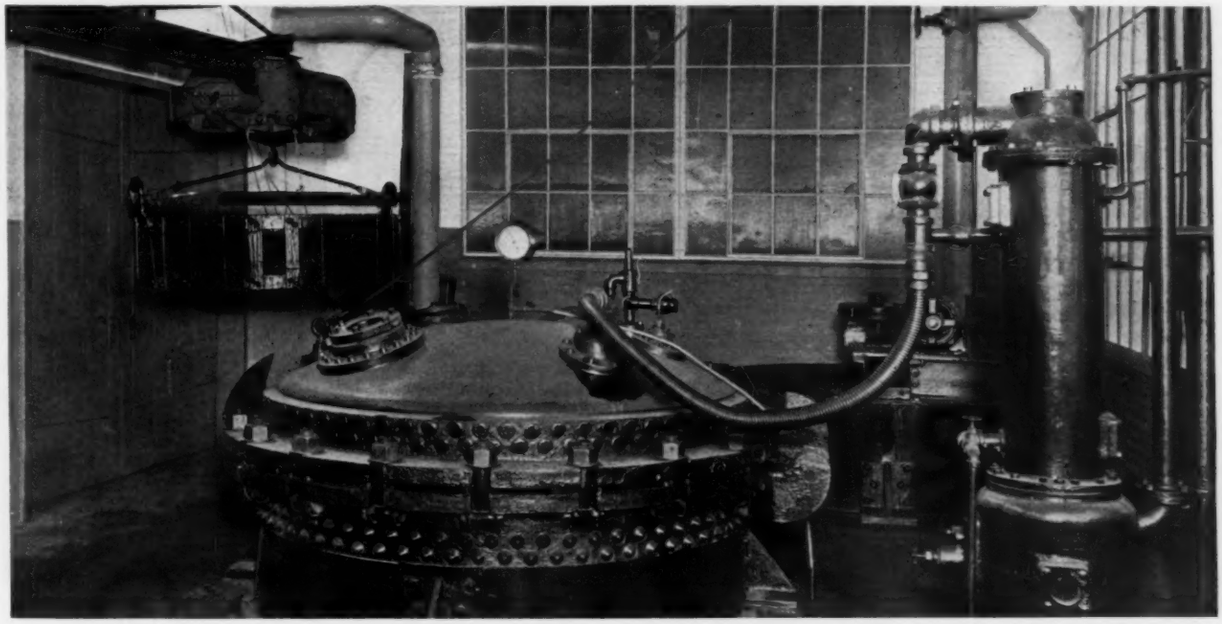


Figure 1—A typical view of the top of an impregnating tank and its attachments. The bottom of this tank, which is below the floor, is shown in Figure 5. At the left of the illustration above may be seen one of the baskets used for handling the coils or windings, while the vacuum and air line hose are shown at the right. Notice the gauge and the safety valve in the tank cover

ings. These tanks are oil heated and extend through three floors.

Figure 2 shows a sectional diagram of the heating and storage tanks. Both are alike and are used alternately for storage and heating. The process is as follows:

1—Coils are placed in tank A as shown.

2—A vacuum pump is used to draw out all moisture. Valves C and E are closed with valve D open.

3—The impregnating gum, after being heated in tank B to a liquid condition, is drawn over into tank A by

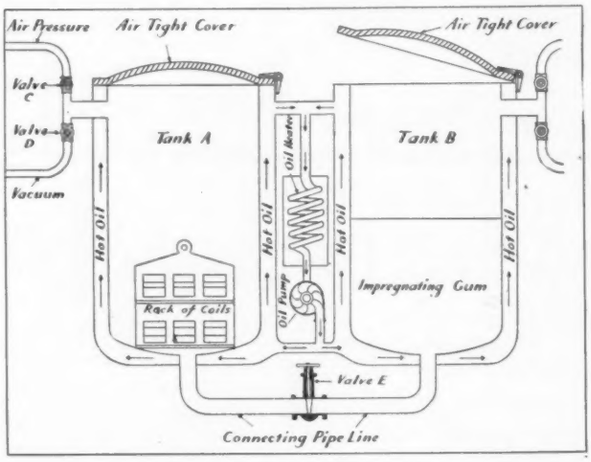


Figure 2—A line drawing of a typical impregnating tank, showing the method of heating the compound and the connections between the two tanks with the various control lines

closing valve D, leaving valve C closed and opening valve E, until coils are completely covered.

4—When the coils are covered with compound, valves E and D are closed, then valve C is opened. Air pressure is thus established in tank A, which is maintained under pressure until the coils are completely impregnated. A circulation of hot oil is maintained in a jacket around tank A during the process of impregnating.

5—When ready to unload tank A, valve D is closed while valve C and E are open, the air pressure supplied by having valve C open, forces the compound back into tank B.

In Figure 3, a similar impregnating tank having steam heated coils in the mixing and main tank is shown.

The following are the operating details when this smaller tank outfit is used:

1—Coils to be impregnated are loaded in baskets, these coils being separated by wood strips to allow free access of the gum and also to prevent sticking when unloading.

2—Coils are baked for at least four hours at 230 deg. Fahr.

3—For drying, the temperature is raised to at least 302 deg. Fahr. and a 27-inch vacuum is maintained. The coils are allowed to dry under these conditions for two hours.

4—For impregnating, the valve to the vacuum line is closed, admitting hot liquid gum until the coils are covered. Then a valve between the storage and treating tanks is closed and air pressure of ninety pounds is applied and held for seven hours. During the period of impregnation, the temperature must be maintained between 248 to 257 deg.

The drop point of the gum must be tested at least twice a week, and after the addition of compound to that in the storage tank. A test tube is used in each impregnation run to determine the thoroughness of the impregnation, and in addition to this coil is cut open at least once in every third run to check the penetration.

From the foregoing may be observed that the vacuum impregnating process employs the following principles:

1—Preliminary drying of coils by the application of heat.

2—Complete drying by creating a vacuum and applying heat at the same time. The importance of this can be brought out by one of the basic laws of physics, which is "A decrease of pressure on the surface of a liquid lowers its boiling point." Therefore, by creating a vacuum and applying heat at the same time, the moisture is driven out in a more efficient and thorough manner than simply preheating at atmospheric pressure.

3—Then, after complete drying and while the coils or apparatus is still hot, the liquid compound is forced into all parts of the object by air pressure applied to the upper surface of the compound.

It is the combination of these three factors, vacuum, heat and air pressure that insures the thorough penetration of the compound into the innermost part of the coil. To this might be added that the gum must be fluid enough to penetrate or the benefits of the vacuum and pressure are lost.

Moisture is a source of great trouble in untreated insulating materials. If a field coil, for instance, is wound with a large number of turns of bare copper strap with two thicknesses of 0.015 asbestos paper between turns, and this coil is preheated and dipped without driving out all of the moisture and the asbestos paper is not filled with varnish, there is a chance of failure in paper service as follows: When the field coil heats under load, it will tend to drive out the moisture, but with the outside edges sealed, this moisture is concentrated in spots, which results in breakdowns between turns and a burnt out coil.

Such a case is shown in Figure 4. At A a split section of a strap wound field is illustrated. These sections come together just as you would close a book. The outside appearance of this coil would indicate that it was well impregnated with gum, but upon opening it, the white parts show that it was poorly treated inside. This is a case

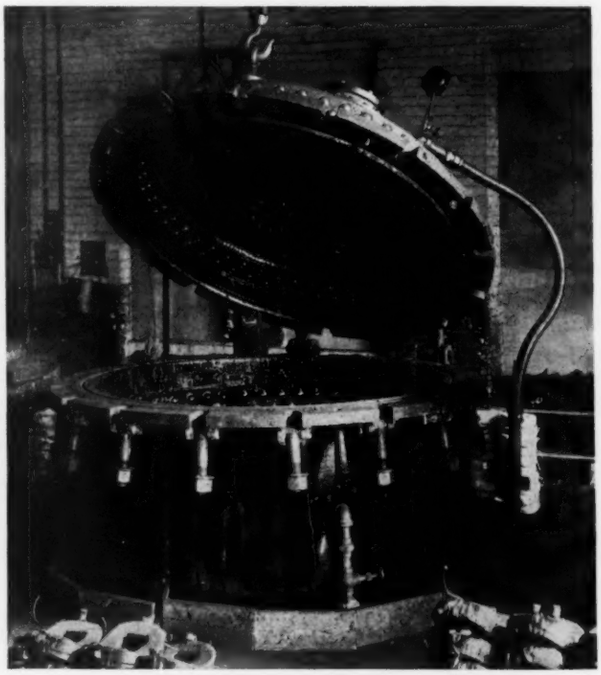


Figure 3—The top of a vacuum impregnating tank as it is being closed. The covers on such tanks must be absolutely air tight, hence the gasket between the cover and the tank and the large number of heavy clamp bolts to hold the lid down

of an outside seal only. At B is a view of one of these sections. The compound penetrated the first few turns, but the remainder are untreated asbestos paper and bare copper. D shows the coil cut open crosswise, and the condition of the material between turns. In this coil the gum tapered off to nothing from the outside edge to a depth of 3/8 in. on each turn. A well impregnated section of the coil would appear as shown at C.

The advantages of the vacuum impregnating method for coils and apparatus can be summed up as follows:

1—Insulation between turns or conductors improved.
2—A compact coil is secured free from small air spaces, well sealed and cured, moisture and water proof.
3—Being compact and filled with a solid compound, its heat radiating qualities are improved.
4—A more rugged and substantial coil, better able to withstand vibration and the pounding from severe operating conditions.
5—Compound impregnation is quicker, as in a single run the coat of compound applied amounts to four or five coats applied by the varnish dip and bake method.

The disadvantages of the process can be listed as follows:

1—Initial outlay for equipment is high.
2—Maintenance high.
3—Requires more operating skill and care.
4—Requires closer inspection and scraping of test coils.
5—Requires more space than a dip tank and oven, and is not as flexible.
6—Requires more attention to details in the materials used in constructing coils and methods of applying them.
7—Adds to the labor and material for any object impregnated, when a smooth finish is required.

Solid compounds as distinguished from liquid or insulating varnishes, as the latter are more often called, are more or less plastic solids at ordinary temperatures which liquefy upon attaining a certain degree of heat (212 deg. F. or above), and permit application by pouring around the parts to be protected or by forcing into the interstices of coils and insulation by the vacuum-pressure-impregnation process. When again cool, such compounds regain their original solid state. They require no eliminating of solvent nor oxidation to harden as do the varnishes.

Solid compounds as a class have some distinct advantages. They permit more rapid execution of a given job, are specially useful for water proofing, acid protection and filling of coils, and also allow better consolidating and consequently higher thermal conductivity. They, however, give rise to some serious objections; they become very brittle in cold weather, they have a tendency to flow slowly at temperatures of operating machines and even to again liquefy at heats that may be reached on overloads of any consequence. These qualities render their use almost impossible upon armatures and other revolving parts.

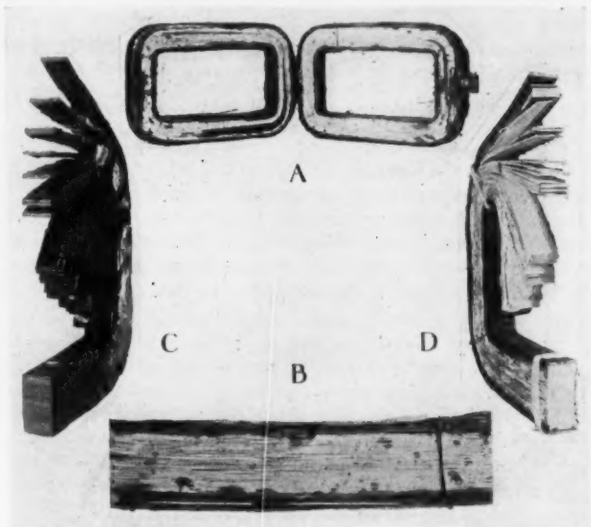


Figure 4—A split section of a large coil that has been poorly impregnated is shown at A, while at B is a larger section of the same coil, showing that the compound penetrated only the first few turns of the coil. At C may be seen a thoroughly impregnated strap coil as contrasted with the very poor impregation shown at D, which would be very unsatisfactory in service

Solid compounds are generally manufactured from vegetable or mineral gums. They therefore contain a certain amount of what may be called "essential oil." Under continued heat this oil very slowly evaporates, thus raising their melting point. The function of the compound reducer is to re-supply this essential oil or an equivalent, and by so doing keep the melting point of the material in the tanks within stated limits. Such reducers sometimes consist of oil alone. Sometimes they are compounds of simply lower melting point. Their correct use depends upon many variables such as: the quality of the original compound; the heat maintained in the storage and impregnating tanks; the percentage of the compound used per operation and replaced by new material; and the method of heating tanks, etc. It is for this reason that in many cases, especially at the start, much trouble is experienced that might have been avoided and a good deal of material lost by becoming unmanageable because of too high melting point or some similar cause.

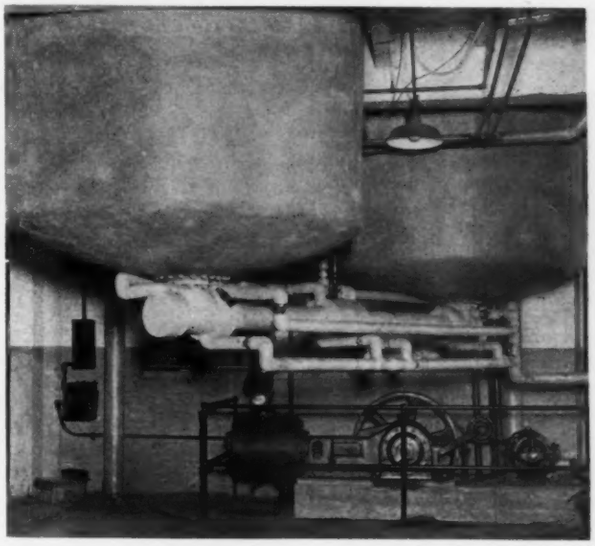


Figure 5—The bottom of an impregnating tank, showing the various connections and the vacuum pump below. This is the bottom of the same tank as is shown in Figure 1

There are two critical temperatures of great interest in the comparison of different samples of compound or in the determination and provision against change of a given material in service. These are the "dropping point" or temperature at which the first drop separates itself from a small ball of the product moulded around a thermometer bulb and the "liquid point" or higher temperature that must be reached before the material can be advantageously used. The temperature difference between these two points should be as small as possible. In other words, the change from solid to liquid state in a good compound should be as abrupt as raw materials will allow.

Very similar materials of suitable melting points are often sold to the trade under such names as battery box compound, junction box compound, and the like, depending upon their use.

The next section of this article will take up the subject of insulation against high temperatures in coils and windings.

WHAT About the COPPER Market During the *Next Decade?*

Review of conditions indicates that the electrical manufacturer may look for an unavoidable upward trend in the price of this metal

BY H. W. CRAFFORD

THE new order of things in the copper market is aimed at stabilization of prices on a basis which will be fair to producers and consumers alike. The industry's leaders are just as firmly opposed to excessive price increases as to prices that are inadequate for the industry's support and growth. Runaway market conditions are hardly likely to ensue, so long as the industry's present leadership is in power. But the electrical manufacturer will do well to face the fact that prevailing copper prices are out of tune with the general run of commodity values, and that upward adjustment, while perhaps slow, is unavoidable.

Utah Copper Company above ground mine, showing the mining process in successive steps along the mountainside

Elements Which Influence Price

THE world's annual copper requirements are about 3,500,000,000 pounds. While the potential addition to the supply in the next ten years is estimated at about 1,500,000,000 pounds, some observers, mindful of the quickened needs of the electrical industry in the next decade, believe that the world's requirements will outstrip the supply. The probabilities are that in the next few years more of an equilibrium between demand and productive capacity will be established.

While there are copper producers who fare relatively well in a 14-cent market, the incentive to make larger capital investments for extending operations is not very strong. Authorities believe that, based on the present purchasing power of the dollar, a 15-cent per pound return for refined copper is the minimum basis on which the industry can thrive and grow, commensurate with the increase in demand resulting from natural growth of population and higher standards of living which call for electric light, power and conveniences in the world's out-of-the-way places.

The latter factor bids fair to increase the cost of copper production in Africa and South America, both large sources of present supply, and larger potential producers. Wages and overhead cost in both these continents are rising.

The latest development in the copper producers' program for rehabilitating their industry is the organization of a Copper Institute, primarily as a statistical agency, providing members with information necessary to enable producers to formulate operating policies that will eliminate a glut in the supply when demand runs low and there is a paucity in available tonnage when consumers' requirements are expanding.

About half the copper consumed in the United States is used for electrical purposes. Even in years of extremely low prices, such as 1927, the electrical industry's copper bill approximates $100,000,000.

Electrical manufacturers too frequently regard the price of copper as a problem of paramount importance to public utilities corporations and those who specialize in equipment for them, but as not vitally affecting the general run of electrical products. While copper consumption by public utilities is heavy, the tonnage absorbed in the manufacture of domestic appliances and general electrical manufactures exceeds it. Even seemingly so restricted a field for tonnage outlet as radio is considered by the Copper & Brass Research Association as a potential market for 20,000,000 pounds of copper a year, and the copper coils in domestic electric refrigerators give to the copper industry a relatively new sales-field.

Knowledge of Market Necessary

TRIVIAL as an advance or decline of one-eighth or one-quarter of a cent in the copper market may seem, such a frequently occurring price change, viewed in the light of the electrical industry's annual consumption of about 800,000,000 pounds, involves hundreds of thousands of dollars. While the large electrical consumers of copper keep in intimate touch with developments in the copper market, there are those who unjustly censure producers or fabricators for price advances when, had they kept posted on developments, they would have sensed that prices were due to rise and could have anticipated their requirements.

Electrical manufacturers are under obligation to the copper industry for its propaganda to extend the sale of electrical products and of current consumption. The copper producers recognize that extension of the electrical industry means extension of the copper industry.

Fear has been expressed that, through use of copper where other material might be employed, the supply for electrical use might be so lowered as to be sharply reflected in prices. This danger is extremely remote. Given the incentive of constantly growing demand, the copper industry can greatly increase its production.

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

Canadian Conditions

The first half of 1928 was the most active period ever enjoyed by Canadian business. An official analysis of returns for the six months ended June, 1928, as compared with the same period of 1927, credits an increase of 14 per cent in the physical volume of business to a gain in imports of 10.5 per cent; manufacturing, 5 per cent; industrial employment, 5.5 per cent; car-loadings, 5.5 per cent; mining, 7 per cent, and construction contracts, 34 per cent.

Conditions in Italy

Italian foreign trade figures for the first six months of this year show a heavier trade deficit than was realized during the corresponding period of 1927. Both imports and exports decreased in value, but the decline in exports was comparatively greater, going down to 6,997,000,000 lire as against 7,989,000,000 lire in 1927 while imports registered 11,105,000,000 lire and 11,805,000,000 lire, respectively. In consequence, the trade deficit rose from 3,815,000,000 for the first half of 1927 to 4,107,000,000 lire for the corresponding period of 1928. June imports totaled 2,124,000,000 lire and exports 1,412,000,000 lire, both being the highest for this year.

Conditions in Japan

A mid-year survey of economic conditions in Japan reveals a slight recovery from the financial troubles and business depression of 1927. Business during the first half of 1928 was more active, although the value of foreign trade was smaller, owing to lower prices, exchange fluctuations, and the adverse development in the Chinese situation in the late spring. Crop conditions have been more favorable and production is expected to exceed the 1927 level. A bumper rice crop is anticipated.

Government Tells How to Use Statistics

Practical application of current statistical information by American business men has been one of the outstanding factors in the generally sustained prosperity which has marked the last five years, according to Mortimer B. Lane of the Census Bureau, in a study of the use of current business statistics, just issued by the Department of Commerce.

Periods of similar commercial and industrial activity, he points out, have as a rule been characterized by more or less violent fluctuations. Nearly 300 specific instances of the use of statistics in business have been collected by Mr. Lane, who presents suggestions as to how these figures may be used to the best advantage. The small business man, he states, has been particularly benefited through the use of current statistics, giving him information he could not have hoped to obtain without collective action.

Copies of "How to Use Current Business Statistics" may be obtained for 15 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

June Red Seal Report Shows 250 Awards

The consolidated Red Seal report for June shows 477 applications received and 250 awards made in the United States during that month, compared with 521 applications and 247 awards in May this year and 366 applications and 199 awards in June last year.

Up to July 1 a total of 2,201 applications had been received and 1,286 awards made this year, compared with 3,509 applications and awards in 1927 and 2,537 in 1926. The grand totals since March, 1925, are 8,205 applications and 5,401 awards.

Conditions in France

The situation in France as a whole reflects general confidence. Industrial and commercial activity in July was increasingly strong, despite the vacation period, holidays and the unusual heat. Preparations are being made for an expansion of activities in the fall when, it is believed, business will exceed the normal level for that period of the year.

Production of Electricity Increases 7½ Per Cent

The average daily production of electricity by public utility power plants in June was 233,200,000 kw-hr., nearly 1½ per cent greater than the average daily output in May, according to a statement issued by the Department of the Interior. The total production of electricity by public utility power plants for the first half of the year was 42,359,000,000 kw-hr., an increase of 7½ per cent over the output for the same period in 1927.

Radio Exports Continue to Gain

Exports of radio apparatus as a class during June increased by $121,596, the gain being substantially greater than in May. Radio tubes was the only item under this group which decreased. Argentina was the largest consumer of receiving set components, taking equipment valued at $63,168. Canada offered a good market for receiving sets and accessories. Australia's chief items of import were receiving sets and receiving set components and accessories.

Efficiency in Current Production

The conservation of the nation's coal through increased thermal efficiency in electric light and power plants (as compared with 1919) is 5 per cent of all the coal used each year in the United States, according to the National Electric Light Association. In addition, there is also the saving through the use in factories of electricity purchased from the lines of the public utilities. If the power used to drive industrial motors last year had been generated within the factories themselves, instead of being purchased from water power and high efficiency steam plants of the electric light and power enterprises, there would have been consumed at least 40,000,000 tons of coal, or 22 per cent more fuel than was actually used by the manufacturing industries of the country.

Exports of Electrical Equipment

Exports of electrical equipment from the United States during June amounted to $9,243,320, an increase of $1,580,166 compared with the same period of last year, according to preliminary figures of the Department of Commerce. Foreign shipments of electrical goods for the six-month period ending June 30, 1928, showed a gain of $3,994,850 over the corresponding period in 1927. Some of the larger increases were accounted for by electric refrigerators, motors under 1 hp., radio apparatus and batteries. Smaller gains were made by portable electric tools, fans, electric lamps and washing machines, while exports of domestic heating and cooking devices increased slightly, but shipments of motor-driven household appliances decreased.

Domestic Pumps and Water Systems

June shipments of domestic power pumps and water systems, as reported to the Department of Commerce by the industry, aggregated 1804. This makes a total of 12,175 for the first six months of the year, as compared with 4959 pumps for the same period in 1927, while the total shipment for the entire year 1927 was only 13,058, or 883 more pumps than were shipped in the first six months of this year.

Electrical Imports Decrease

Imports of electrical apparatus into the United States during June decreased by about $500. Imports of radio and wireless apparatus and parts amounted to $20,761 in May and dropped to $5,037 during June. Electrical machinery and parts, not specifically mentioned, increased $13,335 in June, the major portion coming from Germany and Switzerland.

Characteristics That Determine the *Selection* of MOTORS

No. 4 of a Series Discussing Motors of Different Types

In applying the induction motor of any type it is always advisable to apply a motor that will be fully loaded to keep the power factor high

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AND

C. P. ROBINSON
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THERE are some very important divisions under the head of constant speed motors, other than the synchronous type, which was discussed in the June, July and August issues of ELECTRICAL MANUFACTURING. In touching on the various types of motors which come under this heading it will not be possible to include all details and applications, but an attempt will be made to give a clear understanding of the salient features of each type and a few of the characteristic uses.

The Induction Motor

An induction motor or a synchronous motor as it is often called, is an alternating current motor of approximately constant speed and resembles in its operating characteristics the direct-current, shunt-wound motor.

Whereas the conventional, synchronous type has two sources of supply current, the induction motor has only one. It consists of an external stationary part called the stator and an internal revolving part or armature called the rotor. One member, usually the stator, is connected to the source of electrical power and is called the primary. The other

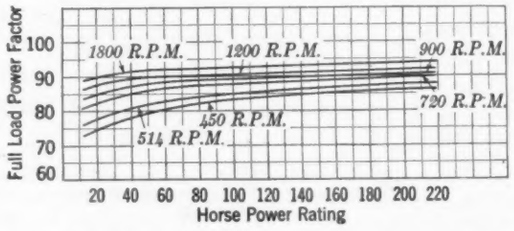


Figure 1. For different horsepower ratings, the full load power factors of standard lines of 60-cycle single squirrel cage motors vary with different speeds, as shown in these curves

member, called the secondary, is short circuited upon itself (or through a resistance for starting purposes) and receives its energy from the primary by electromagnetic induction, as in the transformer.

As in the case of the synchronous motor the rotating magnetic field of the primary revolves at a speed fixed by the number of poles and the frequency of the current supplied to the motor. This is called the synchronous speed and is shown more clearly by

$$N = \frac{120 \times \text{Frequency}}{\text{Number of poles}}$$

The secondary which is dragged around by the revolving

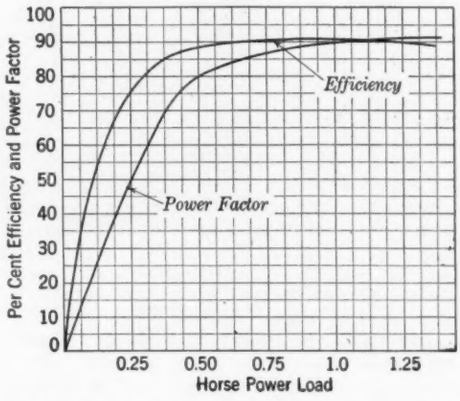


Figure 2. The efficiency and power factor characteristics of a 50-hp., 1200 r.p.m., 60-cycle induction motor show that it should be fully loaded to obtain best operating characteristics

field of the primary tries to keep up with the primary. However, the secondary always rotates at a slightly lower speed than the primary flux as there must be a difference in speed in order that voltage may be generated in the secondary. The voltage generated in the secondary is proportional to the difference between the speeds of the primary flux and that of the secondary winding. Thus the difference in speed is what causes the secondary voltage and current. From this it is seen that the speed difference is roughly proportional to the torque and output of the motor. Such an assumption is reasonably exact under normal operating conditions near synchronous speed. The difference in speed is called the slip, usually expressed in per cent.

$$\text{Per cent slip} = S = \frac{N - \text{Rotor speed}}{N} \times 100$$

At rated load the slip of small motors is between 6 and 8 per cent, and of large motors between 2 and 4 per cent.

When the induction motor is operating under load there are two components in the kv-a. which it draws from the line. One component is called wattless kv-a. and is used to magnetize the motor. The other component is the actual kilowatts or power which is converted into torque at the motor shaft.

The induction motor has an inherent lagging power factor, so that in a large plant using a considerable number of induction motors, this should be compensated for by the

use of a few synchronous motors where possible. The synchronous motor may be operated at unity or leading power factor as explained in the preceding article.

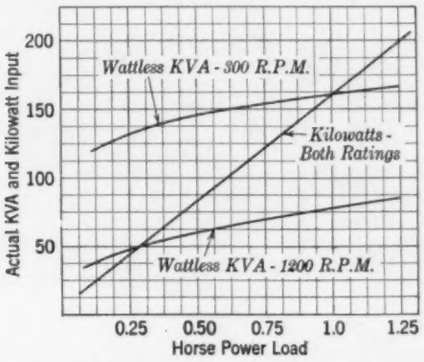


Figure 3. Comparison of the kilowatt power and wattless kv-a. of a high speed induction motor with those of a slow speed motor shows the disadvantage of the slow speed type

In applying an induction motor of any type, it is always advisable to apply a motor that will be fully loaded, for at partial loads the power factor of the induction motor is low. The efficiency also drops off, but not as rapidly as the

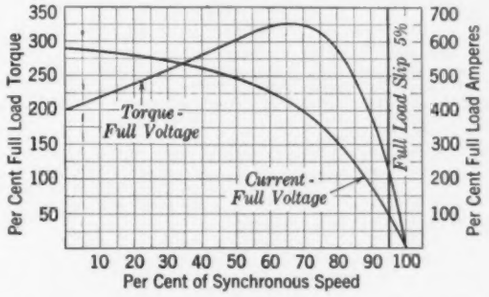


Figure 4. This illustration shows the torque and current inrush characteristics at full voltage of a typical single squirrel cage induction motor with a fairly high torque rotor

power factor. Induction motors that are under loaded or not mated to their load are popularly referred to as "loafing motors."

The larger the magnetizing component or wattless kv-a. is in proportion to a given kilowatt load, the lower becomes the

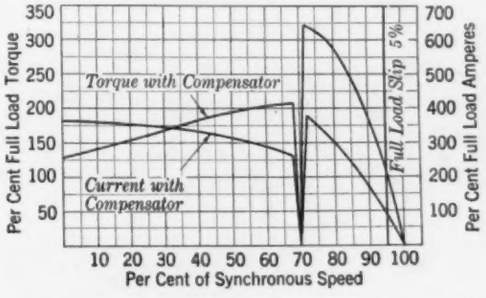


Figure 5. The nature of the starting characteristics of the motor in Figure 4 when it is started on the 80 per cent compensator tap. The transmission line is here subjected to two surges

power factor. Since power factor represents the relation of wasted or useless power to energy or used power, this fact has often been detrimental to certain induction motor installations. However, in the industrial field at large, this type of motor is extensively used, and has many advantages at certain speeds and ratings.

In general, for high speed applications, the induction motor is a very successful commercial motor.

It is well to mention that the general information given so far applies to all types of induction motors with variations. The variations and characteristics of each type are described in the remainder of this discussion.

The Squirrel Cage Induction Motor

This type of induction motor is probably the most used and has a very wide field of application. It consists simply of a stator wound with the usual polyphase winding (except single phase motors) and a rotor constructed of bars welded

Figure 6. The illustration above shows a typical single squirrel cage rotor of welded construction. This is the type of rotor most commonly used in squirrel cage induction motors

to an end ring, resulting in a most simple, sturdy, and reliable construction. There are no slip rings or brushes. For first cost and low maintenance cost, this type of motor has the advantage. Hence, the squirrel cage induction motor should be given full consideration for any application wherein its characteristics seem to fit requirements.

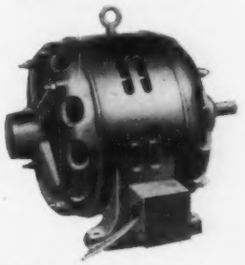


Figure 7. This typical single squirrel cage motor contains a rotor of the type shown in Figure 6 and is used to drive line shafts, fans and blowers conveyor systems, machine tools, etc.

The squirrel cage induction motor has been built commercially in ratings from the smallest up to 300 hp. or 400 hp. and even much larger, for applications requiring speeds from 450 r.p.m. to 3600 r.p.m. It may be said that the

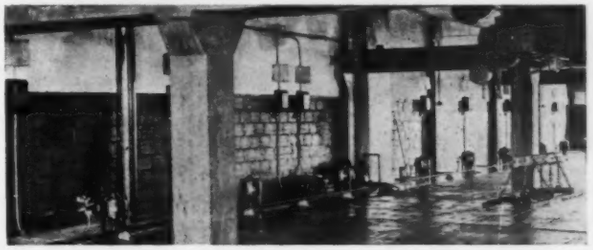


Figure 8. One application of the vertical type of single squirrel cage induction motor is illustrated above, where several of them are driving agitators in a commercial ice plant

speeds for which the greater number of induction motors are manufactured are 900 r.p.m., 1200 r.p.m., and 1800 r.p.m.

Characteristics of the Single Squirrel Cage Motor—At the

higher range of speeds, the characteristics of this motor are very good. Figure 1 shows the full load power factors for a standard line of 60 cycle, single squirrel cage motors. For full load efficiencies refer to Figure 4 of the June issue of ELECTRICAL MANUFACTURING. Figure 2 shows the efficiency and power factor characteristics for a 50 hp., 1200 r.p.m., 60 cycle motor at various loads. It can be seen from this, that the induction motor should carry its full rated load as much of the time as possible, in order to maintain the best operating characteristics.

Figure 3 shows the relation of kilowatt power and watt-

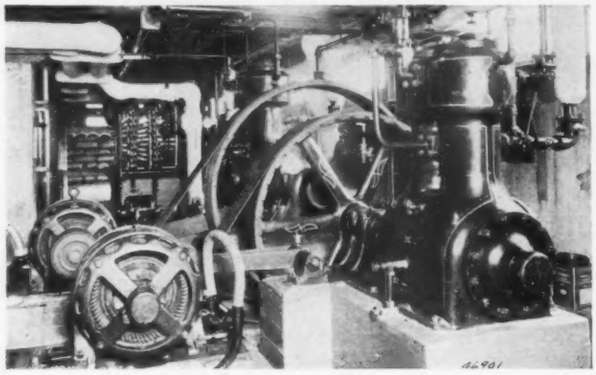


Figure 9. The induction motor is also suitable for use in driving ammonia compressors as shown in the illustration above

less kv-a. of a normal high speed induction motor as compared to the same relations of a slow speed motor. The kilowatt power, of course, is practically the same for both motors, inasmuch as the horsepower output is the same. This shows clearly one reason why the slow speed motor is not as good commercially as the high speed motor.

Usually the standard single squirrel cage motor has a starting torque of 125 per cent to 175 per cent at full voltage, with an inrush current drawn from the line of 500 to 650 per cent of full load torque and full load current, respectively. The maximum or pull-out torque varies from 200 to 300 per cent. These characteristics may be varied somewhat, by the motor designer, for special application.

Figure 4 shows the torque and inrush characteristics at full voltage of a typical single squirrel cage induction mo-

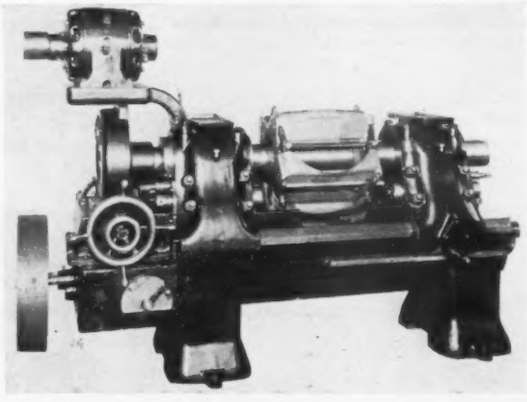


Figure 10. In this illustration an induction motor is shown driving a special type of milling machine. The frame of the machine is so constructed that a mounting space is available for the motor where it will take up the least valuable room

tor with a fairly high torque rotor. In this connection it may be well to mention that the starting torque of this type of motor may be increased or decreased by increasing or decreasing the rotor resistance. However, increasing the rotor resistance to a high value decreases the running efficiency and increases the slip. Hence another type of induction motor will usually be used, wherein the necessary torque may be secured without sacrificing efficiency or speed.

Figure 11. Because it lacks bare, current conducting parts and is safe to operate in dust laden atmospheres, the squirrel cage motor is widely used for driving grain elevators

The single squirrel-cage motor above 5 hp. usually has to be started with a compensator to meet required limits of current inrush as established by the various power companies.

Figure 5 shows the nature of the starting characteristics of the same motor indicated in Figure 4 when the motor is started on the 80 per cent compensator tap. It should be particularly noted that the transmission line is subjected to two surges of current, when a motor is applied to the line in this manner. The second surge may be removed by the use of certain types of resistance starters now available or through the use of other types of motors as will be explained later. A typical single squirrel cage welded rotor is shown in Figure 6, and Figure 7 shows a typical single squirrel cage motor.

The applications for the single squirrel cage motor are many as it is used in almost every known industry for one purpose or another. However, the following are a few characteristic uses; for driving—

1—Line shafts.
2—Fans and blowers.
3—Agitators.

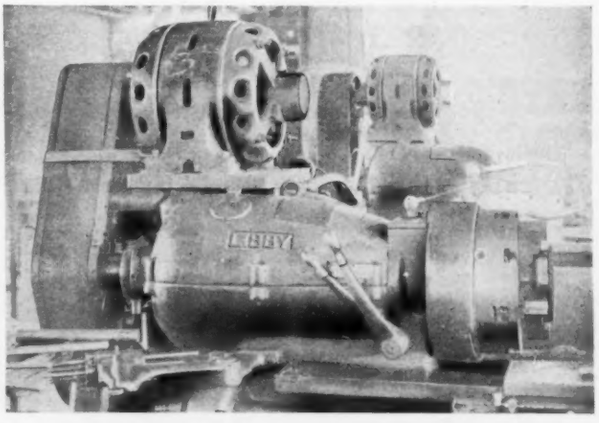


Figure 12. The lathes shown in this illustration show how squirrel cage motors are applied for driving machine tools. They are widely used in this field on lathes, drills, etc.

4—Pumps and compressors.
5—Kiln dryers.
6—Paper presses.
7—Lathes and planers.
8—Punch and drill presses.
9—Conveyor systems.
10—Elevators, cranes and hoists.
11—All kinds of machine tools.
12—Various saw mill drives.

A number of applications of induction motors are shown

in the accompanying illustrations. Figure 8 shows a number of agitators at work in an ice plant driven by vertical induction motors. Figure 9 shows an induction motor driving an ammonia compressor. Figure 10 shows an induction

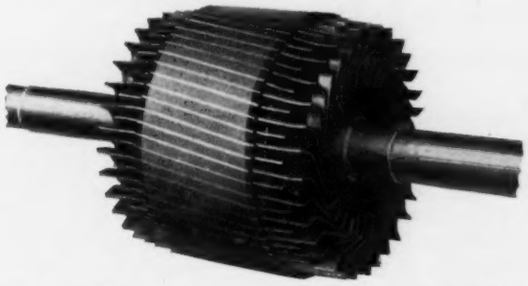


Figure 13. This rotor has an involute brass winding and is designed for use in a special single speed motor particularly adapted for driving elevators, cranes and hoists

motor driving a mill. Figure 11 shows an induction motor driving a grain elevator. Figure 12 shows an induction motor driving a lathe.

Power companies usually permit starting the single

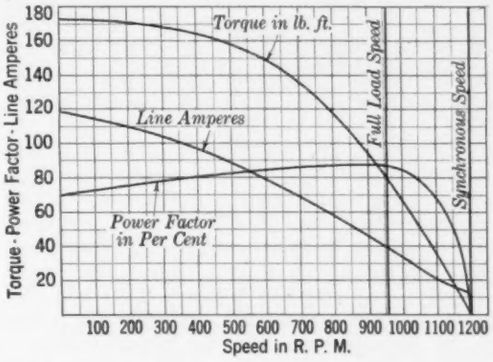


Figure 14. These curves show the torque, line current and power factor characteristics for the elevator, crane and hoist motor. Torque is the characteristic that is the most important

squirrel cage induction motor directly across the line in ratings of 5 hp. and below. Above 5 hp. the starting equipment usually consists of a compensator or resistance type of starter, equipped with overload protection and no voltage release.

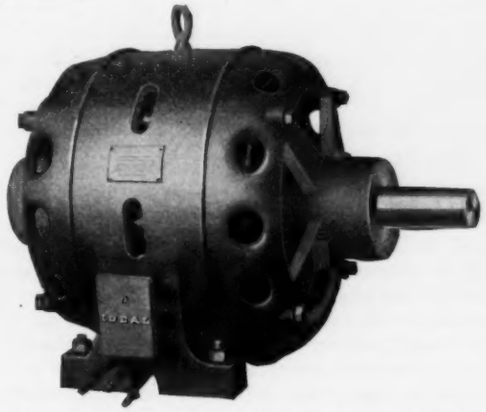


Figure 15. This open type, high torque motor is designed for application on intermittent duty constant speed machines and to give maximum starting torque with minimum line disturbance

There is a special type of single speed high torque squirrel cage motor which may be referred to as an elevator, crane and hoist motor, though it may be used for some other applications, as will be noted later. This motor is ordinarily built in sizes up to about 30 hp. The rotor of this motor may be built as a welded rotor similar to the single squirrel cage rotor as shown in Figure 7 except high resistance, or it may be built with an involute brass winding as shown in Figure 13. The same characteristics are obtained in either case. Probably the only advantage of the involute rotor lies in the increased radiating surface and increased fanning action for dissipating heat over the welded rotor.

Very little attention is paid to any other characteristic

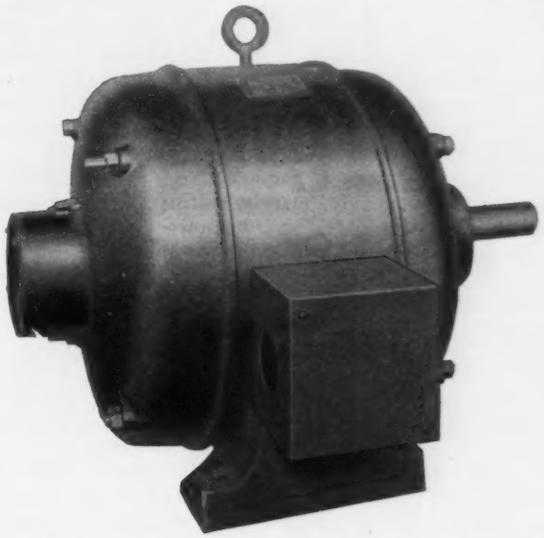


Figure 16. This enclosed, weather and dust proof motor is the type adapted to all the varied forms of outdoor crane and hoist service where the motors have little or no other protection

than torque in this type of motor, for it is essentially a torque machine. It is constantly starting and stopping under heavy loads. Its running period is comparatively brief, hence it is usually given an intermittent rating. Figure 14 shows a characteristic torque curve for an elevator, crane

Figure 17. The high torque motor is particularly adapted to driving drill and shovel equipment, freight elevators and similar machines. A drilling machine is illustrated above

and hoist motor. Figure 15 shows an open type and Figure 16 a closed type motor of high torque characteristics.

These motors may be applied to all intermittent duty, constant speed requirements, and are designed to give maximum starting torque with a minimum line disturbance. When thrown on the line the starting current will not exceed the N. E. L. A. ruling.

The enclosed motor, dust proof and weather proof, is particularly adapted to all the varied forms of outdoor crane and hoist operations. These motors are also used on drill and shovel equipment, conveyors, freight elevators, and similar applications. Figure 17 shows an application of crane and hoist motors to a drilling machine.

Station G-A-G-E, Editor Speaking

Stanley A. Dennis, Editor and Assistant to the President

The Barnacles Be Damned

FOR more than three years the electrical industry has been reading, in its business press, about plans for a great cooperative market development activity, to be promoted by all of the groups in the industry and to yield ultimately a golden harvest for each of these groups. Committees and officers have been appointed; meetings have been held; the Electrical Industry Sales Conference has been organized; and the preliminary activities have been tentatively outlined. The average man or woman in the industry knows that the hope of the electrical business in this day of the "new competition" has fastened on this proposed movement. And throughout the manufacturing group of the industry, especially, there has been a lively expectation of a summons to get behind this activity and to support it in every possible way. Progress has been made in creating an all-industry sentiment favorable to it and it is perhaps not too much to say that the industry is impatiently waiting for the command to go forward.

At such a moment it is unfortunate indeed to discover that here and there are executives whose favorite sport is to "knock" the proposed market development movement.

"Talk, talk, talk," cries one manufacturing executive, "and where the devil does it get us. I want action."

"Action? Forget it!" shouts another, "There'll never be any action."

And so on, while a great idea runs the gauntlet set up by its detractors.

Well, what can be done about these hard-boiled unbelievers? Very little, perhaps. Probably the best thing to do is to forge ahead and forget them. Certain facts, however, characterize them and these facts should be spotlighted so as to make it easier to recognize such obstacles to progress and to avoid them.

Investigation will usually disclose the fact that these objectors have failed to keep in touch with the actual progress that has been made. Almost invariably their knowledge of what has been done toward organizing such a gigantic movement is exceedingly faulty. Nine times out of ten these skeptics simply do not know what they are talking about. Seldom have they caught the spirit behind the movement or a vision of its real objectives. Frequently these knockers are "lone wolves" and have been for years, joining none of the industry's associations, participating in none of its cooperative activities, and failing absolutely to give a hearing to any other man's idea or point of view on anything that concerns the industry. Often, too, often, these "doubting Thomases" have fed fat some ancient grudge, kept alive some rankling disappointment of bygone years.

Barnacles of this kind attach themselves to every great movement in human life. Movements in the electrical industry are not excepted. These human barnacles, so to speak, must be scraped off the ship's hull or else power enough much be applied to send the ship ahead despite them. And one may have faith that now and then a gentle rock may crack a few of them off.

Progress *is* being made by the Electrical Industry Sales Conference. It has been the policy of the conference to make sure it is right and then forge ahead rather than to act like fools that rush in where angels fear to tread. The industry can not afford to invest in hastily organized "campaigns" of a kind whose returns have been as hard to discover as the pot of gold at the end of the rainbow. The conference knows that the industry is tired of that sort of thing. It is not planning a temporary campaign. It is planning a great market development movement to last for years. The ways must be laid with care and precision if the great ship is to be launched successfully and without damage.

Mushrooms still grow up in a night. Oak trees still require a generation or two in which to reach their full height. The planning of an all-industry cooperative market development movement cannot be accomplished in a fortnight. Indeed, it required all of 1926 to persuade the industry even to give thought to the subject of market development. The year 1927 was required to complete the reorganization of The Society for Electrical Development and for the organization of the Electrical Industry Sales Conference. The present year is witnessing the approaching completion of a fact-finding survey which will serve as the foundation of a marketing plan acceptable to the entire industry. A vast amount of work has been necessary to accomplish this much, but the chronic knockers disregard that fact entirely.

Since early summer one of the most intensive and extensive surveys that the industry has ever witnessed has been under way, made by an outstanding advertising and marketing organization engaged by the conference for the purpose of studying the industry itself and the consumer also. This survey will underlie the marketing plan to be recommended by this organization. It is expected that early winter will see the completion of this investigation. The survey of the industry itself has been completed and the consumer survey is starting in the various cities selected for special study.

The need of the hour in this matter is not skepticism, not sharp criticism, not a cynical smile. The need of the hour is the need for exactly the same things that have carried the industry forward for forty-odd years. And these things are vision, faith, courage, initiative, resourcefulness, a spirit dedicated to great achievement. And the greatest of these is faith, faith in the ability of the industry to go forward to goals never before reached—an unquenchable faith, a smiling, happy, conquering faith. Men with such faith in our industry may be hindered but no power on God's green earth can stop them. Let the barnacles be damned!

Dead Stock and Dead Dealers

SLOW-MOVING stock on dealers' shelves presents a problem which is just as troublesome to the sales manager of an electrical manufacturing concern as to sales managers in other lines. And indeed if all of the electrical manufacturers' troubles with this problem were written into one volume what a book of agony it would be! Business experience is replete with suggestions and plans that have proved more or less effective in reducing the volume of slow-moving goods on dealers' shelves, but it seems to have remained for the Crosley Radio Corporation to have made a suggestion which ought to win enthusiastic approval in many quarters. The corporation believes that the best way to reduce slow-moving stock in the hands of dealers is to eliminate dead dealers. In a

recent issue of *Printers' Ink* the company is quoted as follows:

"Our 1928 plans have called for fewer and better dealers. This year we developed a plan whereby our distributors will spend approximately one million dollars in newspaper advertising, and this can be applied by the distributors in such a way as to move the stocks of dealers as necessary.

"We feel that the manufacturer has not sold his product until it reaches the ultimate consumer. Therefore, merchandise in the hands of the jobber and the dealer is considered as a national inventory in which the manufacturer has considerable responsibility. Accordingly, we keep a very accurate record of sales and watch the inventory in the field before we introduce new models. Should we at any time reduce prices on current models, we protect our distributors and dealers for any such merchandise as they may have on hand."

When all is said and done, business still hinges on the man. A sales manager may utilize every possible method for holding down dead stock, but in the end he may find it necessary to do what he should have done at the beginning; that is, eliminate the dealer who is dead from the ears up. Or better still, let the manufacturer prevent such a dealer from ever becoming part of his distributing organization.

Give Thought to Nema

TWO years have elapsed since the Associated Manufacturers of Electrical Supplies, the Power Club, and the Electrical Manufacturers Council consolidated their organizations and formed the National Electrical Manufacturers Association, which is now known throughout the industry as "Nema." During that time the new association has made splendid progress. It has developed a group consciousness among the manufacturers, convincing them that the things which bind them together in one organization are more important than the things which would separate them into various groups and organizations. It has developed the spirit of team play, of common effort toward a common goal. It has made possible greater achievement per association dollar than was possible under the former setup. It has made definite progress toward the solution of various problems that have troubled the manufacturers for a long time. It has set a noteworthy example before the industry of what unity of purpose, determination of effort, and the spirit of mutual helpfulness can accomplish. Elsewhere in this issue of ELECTRICAL MANUFACTURING is a tabulation of the services rendered to the industry by Nema. The array of activities and the practical helps available merit the study of both members and non-members of the association.

Industrial Migration

EVERY successful navigator knows that his ability to reach a distant harbor depends very largely on his knowledge of tides and currents, winds and waves, and in his skill in handling his ship under the conditions which these forces impose. Likewise, it would seem necessary to the success of a manufacturing business that the executives in control should know something about the changing tides of business, about industrial migration—the extent of it, the reasons for it, and the significance of it to the individual concern and to the community in which it is located.

One of first clear pictures of the shifting currents of industry is to be found in a report recently prepared by the organization service of the Chamber of Commerce of the United States, based on information received from 755 cities showing the establishments of primary plants, branch plants, and relocated plants during 1927.

Although the picture is far from complete, it discloses the extent of the mobility of industry and in broad outline the trend of its movement. It covers 1701 plants with 93,026 employees.

Some of the conclusions to be drawn from the survey are:

The shifting of industry is probably less pronounced than has been supposed, but of considerable importance where it has occurred.

Of the total of 1701 plants, 1233 are primary plants: that is, new industries, with 48,859 employees; 218 are branch plants, with 23,937 employees, and 250 are removals with 20,230 employees.

Of the 206 plants established in the three Pacific States, 195 were primary plants, only 6 branch plants, and 5 removal plants.

No abnormal shift of industries from New England is disclosed.

The shifting of industries from larger to smaller cities is largely compensated for by a shift from smaller to larger, indicating that "centralization" as well as "decentralization" is still under way.

A high degree of industrial development prevails on the Pacific Coast, in the Middle Atlantic, and East North Central States in which area nearly half the primary plants covered by the report were established. The report supports the conclusion that a community's industrial development comes mainly from within.

This is the kind of report which should broaden the outlook of the electrical manufacturer and give him a better understanding of the forces which rule all lines of business including his own.

A Growing Market in the South

NEARLY a generation ago Henry W. Grady caught a vision of the possibility of industrial growth in the South going hand in hand with the economic independence of that section of the United States. And ever since Grady's day, the term "the New South" has been a familiar one to the student of American life and to the business man who has been alert to possible new markets.

There can be no question about the existence of a New South. Indeed, it is already here, and growing every day. Industry is waking up to the fact that the New South offers it many remarkable advantages not possessed by other sections of the country. The partial migration of the New England textile industry to the South is known to everyone, and other industries than that are looking thoughtfully toward the Southland. In any study of business conditions and market possibilities in the South one fact is outstanding. On excellent authority it is said that while the production of electricity is increasing at the rate of 10 per cent annually for the country as a whole, it is increasing in the South at the rate of 14 per cent per year.

This means, of course, a constantly growing market in the South for products which are utilized in the production of electricity and it certainly means also a steadily growing market for products needs for the use of electrical energy after it has been produced. When it comes to distribution, sales managers are finding it necessary to give increasing thought to the Southern market. The line of least resistance is to think, "My market, of course, lies in the progressive North." But the manufacturing executive who is wise enough to think twice, has found it necessary to give more careful thought each year to the steadily growing electrical market in our Southern States.

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Nema Affiliates with American Institute of Architects

Provision has been made for carrying the message of interested Nema Sections to the architects through the membership taken out by Nema in the Producers Council. The Producers Council is affiliated with the American Institute of Architects and consists of companies and associations supplying building materials to architects and their clients.

Electrical manufacturers are not immune from the general criticism that the manufacturers' data to architects is entirely too technical and presupposes a knowledge of the subject which the architects do not possess. Material must be prepared in the simplest language. When the description is so simple that the manufacturer considers it to be an insult to the architects' intelligence, it is approaching the desired form.

Another essential test of desirability is the architects' interest in the material. As a member of the Producers Council, Nema will have the privilege of presenting proposed material to the secretary of the Structural Service Bureau of the American Institute of Architects for criticism before distribution. When Nema is reasonably sure that it possesses material which is of benefit to the architects the association should file same so that members of the A.I.A. may procure it at any time. Care should be taken to label the material with the proper number for the architects' filing system. A copy of the revised filing system will be sent to each member as soon as it is published.

Material from any section for transmission to the architects should be sent to Nema Headquarters.

Plan to Regroup Divisions Proposed at Nema Meet

Motion to regroup divisions of the National Electrical Manufacturer's Association, with the exception of the policies and radio divisions, was made at Camp Nema, July 29-Aug. 1, at Association Island, New York. The report in which the proposal was contained was approved by the board of governors and sanctioned by the Policies Division, and will be forwarded to the membership for ratification.

Vice-presidents, not to exceed five in number, are to be elected annually by the board for a term of one year and will replace the present divisional vice-presidents. The president of Nema will become the executive head of the Policies Division. Any sections having a common interest and being a representative branch of the industry may be organized into divisions by the board. Formation of a Section Council, composed of all section and divisional chairman, was proposed.

Steps to eliminate sub-standard material were taken, following a discussion by C. P. Berolzheimer advocating further use of the Underwriters' Laboratory label. A resolution that a committee be appointed from those sections using the label service was passed. The insignia committee suggested adoption of a Nema label, to be used on products meeting Nema standards and those of the American Engineering Standards Committee, following test and inspection by an impartial laboratory.

It was decided to cut down the total number of association meetings by about one-half. The annual meeting hereafter will be held in the fall instead of in the spring. An estimate of the annual saving to members, through reduced time, traveling and other expenses accruing from the smaller number of meetings, is placed at $300,000.

Department of Commerce-Nema Radio Surveys Continue

Since undertaking the collection and tabulation of radio statistics in September, 1927, the Electrical Equipment Division, Department of Commerce, cooperating with the Radio Division, National Electrical Manufacturers Association, has made four quarterly reports, each bringing out in strong relief the successes and failures of the industry's merchandising.

Marshall T. Jones, chief of the Electrical Equipment Division, is in charge of the radio statistics work, and is being assisted by Major R. A. Klock, chairman of Nema's statistics committee. The Department of Commerce has also collected statistics on the annual volume of business in dollars, the number of battery and A.C. sets sold, and the percentage of business done on the installment basis.

Since 1925 Nema has obtained statistics from member companies showing monthly shipments in units and dollars covering the same items of merchandise for which dealers' statistics are now being collected and classified. These figures were worked into charts which were included in "The Radio Market," published last May. They enable the manufacturer to coordinate his budget, production, purchasing and sales quotas in accordance with the experience of a majority of successful manufacturers over a period of three years. The information obtained through the dealers' statistics serves as a correction factor on the manufacturers' figures.

Bennett New Committeeman

I. A. Bennett, vice-president of the National Electric Products Corporation, Pittsburgh, has been elected to the executive committee of the National Electrical Manufacturer's Association.

Handbook of Radio Standards Represents Nation's Work

Four hundred and fifty radio standards are defined in the fourth edition of the Nema Handbook of Radio Standards which has just been published by the National Electrical Manufacturers Association. This is an increase of nearly fifty over the number of standards contained in the third edition, brought out last year.

The fourth Nema Radio Handbook contains 106 general standards, 97 transmitter standards, 121 receiver standards, 64 on power supply and 60 on vacuum tubes. There is also a listing of more than 700 subjects in a cross-referenced index. The handbook includes a number of tables and curves giving useful data on general purpose and audio output tubes.

The Nema Handbook of Radio Standards is a reference work of practical information concerning the manufacture, test and performance of radio products. Its standards represent the result of many years' research and investigation by this organization, its predecessors, their sections and committees. The standardization thus effected has resulted in greater uniformity in engineering and manufacturing practice and improved quality of radio products.

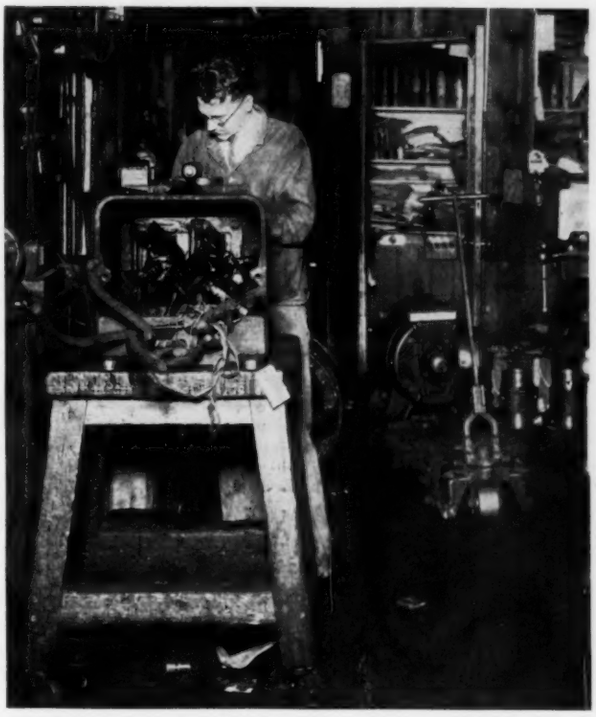
In the preparation of these standards advantage has been taken of the work of other organizations striving toward helpful standardization, and due credit is given to all organizations whose standards have been guides, helps and sign-posts along the way. The book, representing as it does standardized practice in the United States, assists in harmonizing practices in the industry, promotes production economies and consequently benefits millions of broadcast listeners.

Radio Equipment Survey Shows Increased Summer Sales

Radio dealers in the United States disposed of 27,874 radio receiving sets from April 1 to July 1, 1928, according to a survey by the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, made in conjunction with the radio division of the National Electrical Manufacturer's Association. Of this number 21,371 were battery operated.

The survey to determine the amount of stocks in the hands of radio dealers on July 1 disclosed that the total number of loud speakers on hand April 1 had diminished to 28,920, ordinary speakers being far in advance of the amplified type. Socket power units, which numbered 34,912 April 1, had dwindled to 19,696 three months later. There were 241,885 less receiving tubes on hand at the date of the last survey.

Forms for Production and *Material Costs* in a MOTOR REPAIR SHOP



Records in one of the largest repair shops in the Metropolitan area have proved an invaluable aid to Venino Bros. & Co., Inc., in conducting a profitable business

By WILLIAM W. BAXTER
Associate Editor,
ELECTRICAL MANUFACTURING

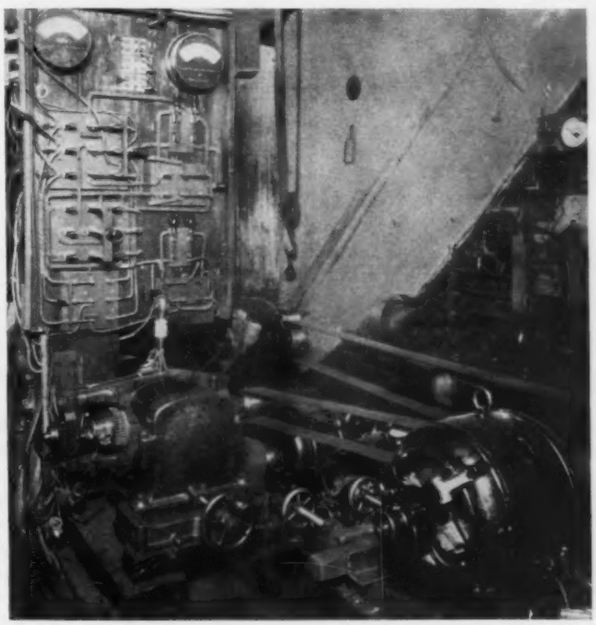
MOTORS, motors, and still more motors, piled in racks, on work benches and on the floors—motors of every size and kind, and in countless numbers, mixed in with controllers of all makes and a generator here and there—until one is astonished to learn that there are so many of these devices in every day use; such is the first impression of the casual visitor to the motor repair shop of Venino Bros. & Co., Inc., of Newark, N. J. Yet, in the midst of this seeming chaotic conglomeration of electrical equipment is a profitable business, that is conducted very systematically and efficiently. It must be, for Venino Bros. & Co. has been in business in the same location for thirty-two years, and they still have as customers many of the first patrons of the company.

Established first as an electrical contracting business by Venino & Auberbacher in 1896 the business has steadily increased until today Venino Bros. & Co. is one of the largest motor repair shops in the Metropolitan area. Motor repairing, however, is not the only business of the company. It is fully equipped with all manner of facilities such as would enable it to undertake any kind of electrical repair work, as well as contracting and the installation of electrical equipment, and on a large scale.

After a few years as Venino & Auerbacher, Fred Venino took over the business and operated it until 1912 when the name was changed to that of Venino Bros. & Co. The company was incorporated in 1927 and continues to operate under its incorporated name with Henry Venino as president, A. Venino, vice-president, and O. Venino, secretary and treasurer. All of the Venino brothers are experienced electricians who entrust the supervision of their repair work to Frederick Seibel, Jr., a man who has thirty-four year's experience in electrical work, twenty-four years of it being with Venino Bros. & Co.

Like other organizations engaged in a similar line of work, Venino Bros. & Co. go about the business of repairing motors much in the ordinary manner, except that the company has some very interesting methods for doing the work, together with some novel forms for recording the nature of the work, who did it, and what it cost, as well as the amounts of different kinds of materials required. This applies both to shop and field jobs, as the company makes a practice of removing and installing work as well as repairing it.

The principal plant of Venino Bros. & Co. is in a building of three stories and basement located at 65 Hamilton St., Newark, which serves in a measure as repair shop, offices and ware rooms for but a small part of the materials used. Other facilities include a warehouse having thirty thousand square feet of floor space for the storage of other materials and supplies. Part of this space is also used for repair work, as will be explained later. Then too, the com-



In the upper left hand corner is shown a section of the controller repair department of Venino Bros. & Co., of Newark, N. J., while the illustration above shows one of the test sets in the basement of the motor repair shop where all work is tested

pany has its own fleet of trucks which assist in expediting its deliveries of repaired and new equipment.

The entire secret of the success of the company, aside from the satisfactory service it has rendered for years, lies probably in the orderly manner in which the work is carried on. Every piece of equipment coming into the shop, whether for minor adjustments or heavy repairs, undergoes the same routine. It enters the receiving room, which is in the base-

Venino Bros. & Co. use three different time slips in the repair and installation of equipment. One of these is a white slip for shop work only. Another is red, to indicate field work, and a third is yellow, to indicate work performed for other electrical contractors, which is often done in both the field and shop

ment of the building, and there it is listed on what is called a receiving order. This is numbered and from that time on until the work is completed every charge to the job is made under the same number. From the receiving room the work moves to that department of the shop assigned to that class of equipment. If it is a motor, generator or controller of ordinary size it is taken to the second floor of the building. Here it receives very careful inspection and tests, to determine exactly what work is needed to recondition the device. This is all listed on the inspection form, which serves as a work slip as the job passes through the successive operations.

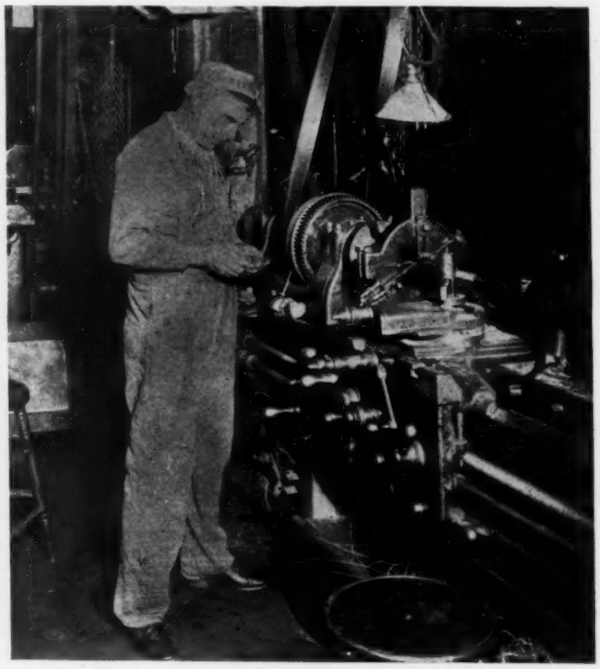
It should also be understood that as is the practice in many motor repair shops, Venino Bros. & Co. must frequently do work on a fixed price or estimated cost basis, in which case only such work is performed as has been included in the original estimate. On such jobs they do not receive the same thorough examination for defects as would work coming into the shop for a complete overhauling, but should any bad defect be found in the course of repair these are called to the attention of the customer, and should he so specify they are included in the repair work. When a job being repaired on an estimate basis is finished the actual cost of labor and materials is carefully checked against the estimate, and in many cases the cost is compared with that of similar work to determine that the charges are correct and at the same time fair to the customer. This, probably, is one of the principal reasons why Venino Bros. & Co. still has so many of the original customers as patrons, for it is a fixed rule with this organization that it render efficient and satisfactory service at all times, and at reasonable cost.

Then, to insure that labor charges on the different jobs will be accurate a time clock has been installed in the shop and each workman is supplied with a card bearing the job number he is to work upon. At the left of this card is a space in which he records the exact time he starts work, and as may be seen from reference to the accompanying illustration of the shop time sheet, provisions are made for four periods of work. Two of these may represent morning and afternoon, or it may be that in the course of a day an operator is required to start and stop work on the same job several times. In that event he makes a record of each case. On the right of the form, other than spaces for descriptions and job numbers, is space in which the mechanic records what work he has performed, additional remarks being made on the back of the sheet or card. At the bottom of the slip, and at the left, is space for entering the total time of one man on the job. Then, to differentiate between shop time and field time, slips of different colors are used. White cards are for shop work, pink slips are used in the field and for work performed for other contractors, which is often done by Venino Bros. & Co., a yellow slip is used. When the job is completed and installed these cards are assembled and from them it is a simple matter to determine the exact amount of labor.

From reference to the illustrations of the time sheets it will be noticed that one of them bears the heading "Maintenance Time Sheet," and that on this form space is provided for entry of the estimated time of the work as well as the actual time required. While this may appear as of little consequence it is only one of the many minor factors in stopping the innumerable small leaks in the motor repair and contracting business, which so materially affect the margin of profit at the end of the year. Venino Bros. & Co. early recognized this fact and for this reason are very particular about comparing estimates with actual costs or elapsed time on all work. In this way they are able to render very conservative estimates and in the end profit thereby.

Then, as a further check on the work, each workman is required to set out in detail just what operations were performed on any one job. Space is provided for these reports on the back of the time sheet and these serve also as a further check on the work, and are an invaluable aid in making estimates on similar jobs.

On the yellow time sheet, or the work slip used by Venino



In the machine shop section of Venino Bros. & Co. is an assortment of machinery and equipment with which to undertake any kind of repair work on almost any kind of electrical equipment

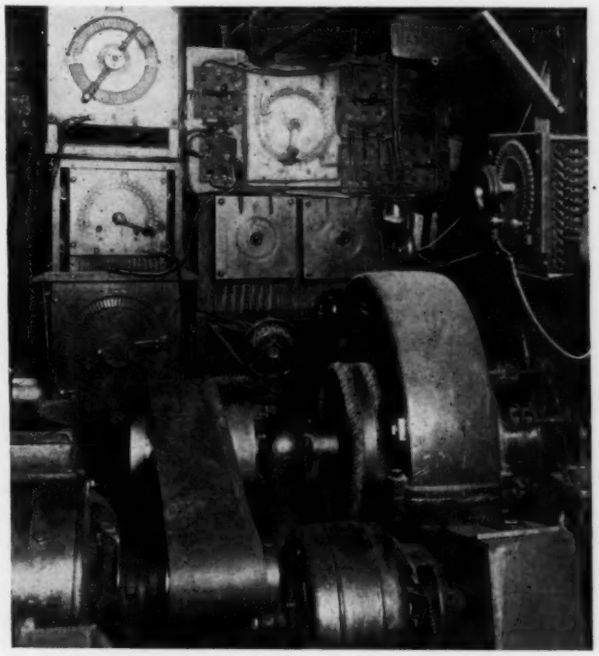
Bros. & Company's workmen in recording time and work performed for other contractors, very similar spaces are provided for the recording of time and materials, as well as an actual account of the work done. These too serve as checks against estimates and costs, and further tend to prevent losses in similar future cases.

When new materials are required these are withdrawn from the stock room on a requisition similar to that shown among the illustrations. These bear, in addition to the job number, the name of the employe, the name and address of the customer and space for listing materials.

If materials are required that are not carried in stock, or if workmen in the field are required to purchase materials for a job, records of these purchases are made on the invoice form shown with the illustrations. After the work is finished these too are assembled and from them a complete list of materials may be compiled.

With respect to the use of materials it might be well to point out at this time that a motor rebuilder cannot be too particular in knowing that every piece of new material used is correctly charged to the job. While it may be only a small screw, a few ounces of wire or insulation, all of these items at the end of a month or a year would possibly total several dollars, which if not properly charged must be set down as a loss. Then, too, as Venino Bros. & Co. carries thousands of dollars worth of materials and parts in its stock rooms, of which it has several, some provision must be made for checking materials and parts on hand against those used or disposed of. It is for this reason that such particular care is exercised to determine that every piece of material is properly charged.

It should be noticed in connection with the receiving department form that spaces are available for recording a complete description of the job. These are not used in any manner as having any bearing on the characteristics of a motor or generator, as a separate data sheet is employed for this purpose. It contains spaces for recording any possible information that is wanted and these are retained for future reference. These, except for a tag placed on each job and bearing its number, are about all the forms or records kept by the company, other, of course, than the bookkeeping system used in the accounting department.



Venino Bros. & Co. has a full complement of facilities of all kinds to permit of testing any electrical device at any capacity up to 300 hp. and of any current or voltage rating

In the way of shop equipment Venino Bros. & Co. has an extensive assortment of facilities. These, except for the testing equipment, grinding machines and the facilities in the warehouse, are all located on the first and second floors of the shop. In the machine department there are several

VENINO BROS. & CO., INC.
Requisition Sheet--Shop Dep't.

Date

Job No.

Employee

For

Address

Charged by

MATERIAL		

When new materials are required on any job, requisition forms like that shown above are used. These are made out by the workmen and are charged directly to the particular job number

lathes of different types and capacities and two men are regularly employed on nothing but machine work. They turn bushing, true commutators and other similar operations, as well as all machining on shafts, pulleys, keyways and the like. Along both walls of the first floor are two long benches on which practically all of the work is done. These are convenient to the machines and are served by overhead monorails equipped with chain block hoists. On the second floor of the building is a section devoted to all coil work. Here are to be found coil winding machines, taping machines and coil spreaders, together with the necessary trimming knives and saws for cutting insulation.

In the repair shop proper, which is on the second floor of the building, and in addition to the heavier machine tools that are common to most motor repair shops, are to be found several of a special nature. Among these is a complete arrangement of small bench tools, such as a small lathe for very accurate and fine work; a small drill press, and other similar equipment. These are used principally on very small work where extreme accuracy is essential. In this same section of the shop is the equipment used for slotting commutators, balancing armatures and fitting and aligning bearings.

One interesting feature of the shop is that every department and all working stations at benches or machines is provided with compressed air outlets. These, as can be appreciated, are used for blowing dirt from the work, and while this practice is not recommended by many motor repair builders, Venino Bros. & Co. clean every piece of work in this manner, and it might be well to add that in its thirty-two years in business, the company has never experienced any trouble from using compressed air to blow out the dirt and dust from motors, generators and controllers. Of course, it exercises extreme care to insure that the air

is absolutely free from moisture and careful tests are made of insulation before the job leaves the plant to assure that there is no water or moisture contained that might inadvertently cause failures or breakdowns in service.

In the basement of the shop are three test blocks. Each

.....INVOICE OF.....192

Our Order No.....

Chg. on ..... Freight.....

.... Cartage.... ....

....Job .....

Per..... Total

VENINO BROS. & CO., INC.—JOB SLIP

When materials are required by men in the field or by men in the shop that are not carried in stock, they are purchased on forms like that shown in the illustration above, and are charged to the job

of these is designed to accommodate different sizes of motors, while other equipment is available for testing either A. C. or D. C. motors and generators up to 300 hp. So that there will be little possibility of grit and dust getting into the machines all grinding and polishing equipment is located in an inclosed room within the basement. In addition there are two baking ovens in the basement with a dipping tank. One of the ovens is gas-heated while the other is of the electrical type, both being fitted with temperature and time controlling devices.

Since facilities and equipment are not available in the principal shop of Venino Bros. & Co., for making repairs to heavy equipment all of this work is carried on in a shop in the warehouse, where all work is performed on equipment of 300 hp. or over. This shop is fully equipped with the necessary tools and other facilities, as well as with heavy testing equipment.

Venino Bros. & Co., employs about thirty-five workmen normally, and with the exception of those men working on machine work exclusively, none of them are rated as specialists in any one line as this company feels that it can accomplish more with all-round mechanics than could be done if each man were to specialize in one kind of work. Then too, such an arrangement provides a more flexible group of workmen, as any one of them can be assigned to any kind of work. This is particularly advantageous since one man can go into the field, remove a motor, generator or controller in need of repair, bring it to the shop, make the necessary repairs to it and then install the device after the work is finished and tested.

Particularly noticeable in the shop of Venino Bros. & Co., is the extreme care with which all work is handled. In this respect every part of any device is carefully inspected for defects or inaccuracies in construction, after which they are thoroughly cleaned and painted. This has to do with the checking of armature shafts for alignment; the measuring and careful fitting of all bearings and the complete adjustment of all attachments, to the end that very little apparatus of any kind is ever returned for corrections or adjustments, once it has been finally inspected.

Receiving Dep't. VENINO BROS. & CO., INC. 65 HAMILTON STREET NEWARK, N. J. № 6850

Date

Name

Address

City State

MOTOR DATA

Maker

Serial No. Shop No.

H. P. Volts Ph. Cyc.

R. P. M. Type

Amp. Rating Style No.

Frame Model Form

Slip Ring Repulsion Induction: Size

New Old A. C. D. C.

OFFICE DATA

Rec'd. No. Order No. Call slip No.

Repair Credit

Estimate Charge No.

RECEIVING DEP'T. DATA—SHIPMENT CONTAINED

Motors Pulleys Base & Rails Oil Starter Grids Controller Rheostat

Via Ex. Chge. Job No.

Remarks

Checked by

Pulley Data

Kind Dia. Face Bore

Base Data

Kind No. Size

Rails Data

Starter Data H. P.

Maker Volts Ph. Cyc.

Type Serial No.

Grid Data

Controller Data

When new work arrives at the receiving department all of the characteristics of the device are entered on the form shown above. This is not a data sheet, but only a receiving record

VENINO BROS. & CO.

WINDING RECORD

Customer *Rec.* *Del.*

MACHINE DATA

Maker *No.* *Slot No.*

Type *HP.* *K. W.*

Volts *Amps.* *Phase*

Serial No. *Style No.* *Special No.*

Winding *Poles*

Arm. No. *Shaft Dia.*

Key Seat *Pulley* *Brushes*

Armature or Rotor Winding	STATOR WINDING
Size of Wire	Style of Winding
Turns to Section	Size of Wire
No. of Wires to Section	No. of Poles
Style of Winding	Turns Per Pole
No. of Bands	Turns Per Section
Width of Bands	No. of Wires to Section
Size of Binding	No. of Sections per Pole
Style of Connection	Slots in Core
Cross Connection	No. of Coils in Slot
Pitch of Leads	Pitch of Coil
Pitch of Coils	Insulation of Slots etc.
Dia. of Body	
Slots in Core	
No. of Coils in Slot	
No. of Commutator Segments	Data of Connections
Size of Slots in Tails	No. of Circuits etc.
Insulation of Body or Core	
Dimentions of Commutator	
Field Coil Winding	Sketch of Form or Coil
Size of Wire Shunt	Remarks and Material on other side
No. of Turns and lbs.	
Size of Wire Series	
No. of Turns and lbs.	

For keeping permanent records of all electrical devices and equipment handled in the shop, Venino Bros. & Co. use a form similar to that shown above. This is filed when the work is done

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

Sonora Appoints Craig Sales Promotion Manager

C. A. Craig, sales manager of Liberty Electric Company, Stamford, Conn., for the last five years, has been appointed sales promotion manager of the Sonora Phonograph Company, Inc. The plant of Liberty Electric Company was recently acquired by Acoustic Products Company in behalf of Sonora.

C. A. Craig

Mr. Craig is known for his ability to make personal contacts with dealers and distributors and has engineered a number of successful sales promotion campaigns. In view of the extensive program of production outlined by Sonora for the fall, he will have an opportunity to continue this work. The Sonora company is preparing an extensive sales promotion campaign in conjunction with its sales and advertising activities. This will be directed to the public as well as to dealers.

Standards Committee Considers New Equipment Project

The American Society of Mechanical Engineers has requested that the following be initiated as one of the four new standardization projects for mechanical equipment under the auspices of the American Engineering Standards Committee:

Standardization of rolled threads for screw shells of electric sockets and lamp bases, purpose of which is the development of thread standards for the new "intermediate" size lamp socket and base and the review and revision of present manufacturing practice for the older types.

General Electric Enrolls Many Student Engineers

Engineering students, representing colleges from the University of California to the University of Maine, have enrolled for the test course of the Schenectady Works of General Electric Company 220 strong since the close of school in May. Graduates of engineering or technical schools in South and Central America, Australia, and Europe are also numbered among the newly enlisted men. Student engineers numbering 522 from nineteen nations and 114 technical schools are employed, representing England, France, Germany, Italy, Spain, Russia, China, Japan, India, New Zealand, Australia, Canada, Holland, Brazil, Chile, Mexico, Switzerland, Philippine Islands, and Cuba.

Expansion of RMA Activities Outlined by Directors

The board of directors of the Radio Manufacturers Association, at their first meeting of the 1928-29 year in Buffalo Aug. 10, moved to expand activities of the organization, particular emphasis being placed on the recognition of television and other scientific developments affecting the industry.

A new and immediate enterprise of the association is to give the radio industry and the public the facts regarding the development of television. The board, deploring premature presentation of publicity about this process, directed that the exact truth regarding television experiments be given in authoritative announcements. On motion of C. C. Colby, former president, a special committee was directed to make a thorough survey of television and formulate a statement for the public and industry. H. B. Richmond, Cambridge, Mass.; B. G. Erskine, Emporium, Pa.; A. J. Carter, Chicago; and M. F. Burns, New York City, all identified with television development, were appointed.

Support and development of broadcasting, cooperative radio advertising, and other activities were planned by the board, together with the extension of RMA service for individual members. The plan for interchange of radio patents, recently approved by the membership at the annual meeting in Chicago, is to be developed. Steps also were taken to obtain more reliable statistics regarding the radio industry than are now available. The fragmentary figures now being circulated fall short of meeting the demands of the industry, the directors believe, and measures to gather more complete statistical information for all branches of the industry were ordered.

New committee chairmen were appointed by President Frost as follows: B. G. Erskine, broadcasting; A. T. Haugh, contact; T. Sheldon, credit; L. E. Parker, distribution of publications; H. B. Richmond, engineering division; W. L. Jacoby, fair trade practice; John C. Tully, finance; G. H. Kiley, foreign trades; C. C. Colby, legislative; H. H. Eby, membership; L. E. Noble, merchandising; Fred D. Williams, patent; J. B. Hawley, public relations and education; T. K. Webster, Jr., resolutions; Morris Metcalf, show; L. A. Hammarlund, statistics; William Sparks, traffic.

Radio Corporation of America Plans Large Expansion

Radio Corporation of America has just passed through the best second quarter in its history and is planning to branch out into new lines. Its control of an apparatus for synchronizing motion pictures with voice and music through RCA Photophone Company, a subsidiary, gives it a position of power in the talking-movie industry, and its message business is developing normally throughout the world. The ship-to-shore business of the company has never been larger than at the present time and is growing annually. Gross business for the second quarter of 1928 amounted to $11,690,679, the second quarter of 1927 brought $6,183,050, the same period for 1926 and 1925 bringing $7,655,438 and $4,584,465, respectively.

General Cable Acquires Detroit Insulated Wire Company

General Cable Corporation has acquired Detroit Insulated Wire Company, the latter becoming united with Rome Wire Company, Dudlo Manufacturing Corporation, Safety Cable Company, Standard Underground Cable Company, and Baltimore Rolling Mills. The Detroit company will function under the name Detroit Insulated Wire Company Division of General Cable Corporation. Its production will be fortified by the manufacturing facilities of fourteen plants, stocks and delivery facilities of the company will be augmented, and the entire list of wires and cables, rods, tubes and sheets embraced by the General Cable Corporation will be added to its line of wires.

Splitdorf Forms Condenser Sales Division Headed by Graubard

Splidorf Electrical Company, subsidiary of Splitdorf-Bethlehem Electrical Company, has formed a new division to handle condenser sales exclusively. S. H. Graubard, well known in the New York metropolitan area, where he was formerly a representative of the Polymet Company, has been placed in charge. The Splitdorf company has manufactured radio equipment since the first days of broadcasting, entering the field by making parts, and later broadening to manufacture fixed condensers, phones, speakers, variable con-

S. H. Graubard

densers, and in the last five years complete sets. With the recent association of Splitdorf and the Thomas A. Edison Company the increased business has led to the formation of divisions, giving special attention to sales of each class of products.

Zenith Creates New Publicity Department for Advertising

William J. Pohlman

C. J. Callahan, advertising manager for Zenith Radio Corporation, announces the creation of an Exploitation and Publicity Department with William J. Pohlman as manager. Mr. Pohlman is prominent in publicity circles, having been previously connected with the Karzas Enterprises of Chicago. As his initial effort with Zenith he directed the "National Zenith Automatic Week" campaign, conducted September 9 to 15.

Religious Film Trust Contract With Sonora Announced

Announcement has been made by P. L. Deutsch, president of Acoustic Products and Sonora Phonograph Company, that a contract has been consummated with the Religious Film Trust calling for the supply of equipment and records necessary for the presentation of sound pictures in 100,000 churches and other religious institutions during the next ten years.

It is planned to film events portrayed in the Old and New Testaments in their actual geographical settings. The costuming will be accurate, and native hordes and tribes, inhabitants of the Holy Land, will be employed.

The Religious Film Trust, a non-sectarian organization, has been experimenting with film synchronizing apparatus for several months with the new project in view. Colonel E. A. Watkin, lecturer who has lived in the Holy Land for 27 years, will direct the first productions, his familiarity with the country and its people making it possible to obtain exact settings.

The Acoustic-Sonora company announces that efficient sets will be produced at a price which will enable churches to install them and have a weekly change of films and records at a nominal cost.

Exhibits for National Power Show Cover Broad Field

Exhibits for the Seventh National Exposition of Power & Mechanical Engineering, to be held at Grand Central Palace, New York City, December 3-8, total 550. They have been tabulated as follows:

Exhibits of power—instruments of precision, 25; electrical equipment, 54; pipe and piping, 18; valves and fittings, 49; steam specialties, 24; pumps, 10; engines and turbines, 19; coal companies, 3; pulverized coal equipment, 10; oil burning equipment, 6; stokers and grates, 14; boiler makers, 12; feed water heaters, 8; feed water softeners, 5; fire brick, arches, 20.

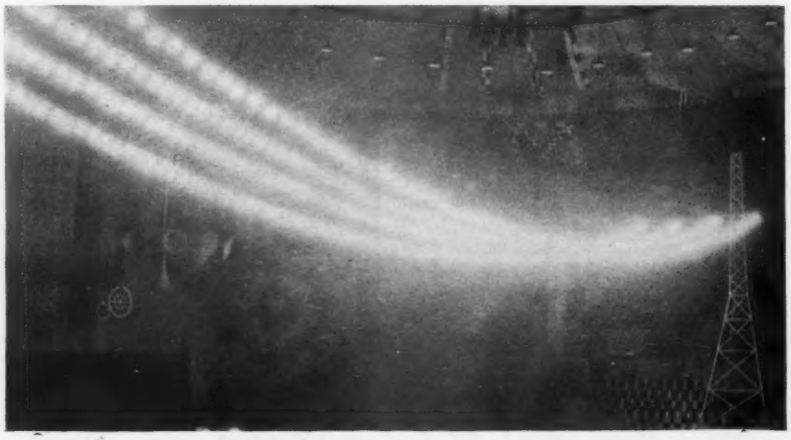
Exhibits of heating and ventilating—radiators, 10; cooling towers, 4; blowers, 20; air conditioners, 5; air filters, 6; gaskets and packing, 9; separators, 9; furnaces, 15; boilers, 12; grates and stokers, 14.

Exhibits of transmission equipment:—belting, 5; belt dressing, 3; belt fasteners, 3; belt chain, 3; pulleys, 7; drives, 6; transmissions, 3; clutches, 6; bearings, 14; gears, 15; couplings, 18; speed reducers, 7.

Exhibits of tools—tools and machine tools, 46; lubricants, 7; lubricators, 11.

Miscellaneous—safety appliances, 14; material handling equipment, insurance firms specializing in boiler and plant insurance.

San Francisco Auditorium Lighted for Show



Illumination for the recent Pacific Radio Exposition was provided by four strands of lights strung between two antenna towers rising forty feet above the balcony of the Civic Auditorium at San Francisco. The efficiency of the scheme was praised by lighting experts throughout the country

Oil Heating Equipment Display Opens in New York Store

The first national exposition of oil heating equipment was held at the John Wanamaker Store, New York, in August, under the auspices of the Oil Heating Institute. Nine of the leading oil burner manufacturers in the country participated in the three weeks' demonstration, which marked the first concerted effort of leaders in the industry to give the public a broad view of the technical advance acheived during the last few years.

The program for the exposition included speeches by Dr. W. W. Peter, associate secretary, American Public Health Association; Leo D. Becker, managing director, Oil Heating Institute; Mrs. Charles E. Gregory, president, New York State Federation of Women's Clubs; Dr. Collins P. Bliss, associate dean, College of Engineering, New York University; Mrs. Mildred Maddocks Bentley, director, Delineator Home Institute; Charles K. Nichols, New York Edison Company; and, M. E. Simpson, chairman dealers' division, American Oil Burner Association.

Kirton Joins Industrial Sales Force of Kellogg Company

W. T. Kirton

W. T. Kirton has joined the Industrial Sales Division of Kellogg Switchboard & Supply Company, Chicago. He will direct the sale of condensers, parts and supplies to radio and electrical manufacturers.

Mr. Kirton has had a number of years' experience in the industry and is acquainted with the problems and requirements of sales work. The Kellogg company manufactures condensers, automobile ignition equipment, bakelite molding, and electrical-radio parts.

Television Apparatus Displayed At Radio World's Fair

Television apparatus developed by Dr. E. F. W. Alexanderson in the laboratories of General Electric Company is being exhibited at the fifth annual Radio World's Fair, which opened in Madison Square Garden, September 17. Dr. Alexanderson's apparatus, marking a new and important step in television, transmits pictures twelve inches square. This is made possible through use of the Moore crater lamp, a neon tube of greater brilliancy than heretofore used.

The improved television projector employs a 48-line scanning disc which throws the picture on the screen and operates on the band from 5,000 to 20,000 cycles. It has been explained

Floodlighting Young's Million Dollar Pier

The east wall of Atlantic City's famous pier is illuminated by eleven Westinghouse Duo Lux units, used in connection with three flood-lighting projectors. The Duo Lux units consist of ornamental lanterns with glass canopies, each equipped with two lamps arranged to permit flood-lighting and thoroughfare illumination from a single unit and standard

by Dr. Alexanderson that more lines in the scanning disc make for greater detail in the picture thrown upon the screen, but in experimental work it has been found that the 48-line disc is sufficient to give good results.

Regular broadcasting of images by television began Aug. 14 at station WRNY, Hotel Roosevelt, New York. This station recently installed equipment for broadcasting images and now carries on regular transmission from its plant at Villa Richard, Coytesville, N. J.

Armstrong Brothers Acquire Mellotron Tube Company

Fray Manufacturing Company, 2021 S. Michigan Ave., Chicago, a new corporation organized by Fred S. Armstrong and Raymond W. Armstrong, has purchased the entire plant and good will of the Mellotron Tube Company. Manufacture of a complete line of radio tubes will be carried on.

Fred S. Armstrong, best known to the radio industry for his work in the organization of the Radio Protective Association, of which he is treasurer, is president of the new company. Raymond W. Armstrong was for seven years in the lamp development laboratory of National Lamp Works, General Electric Company.

"Radiotrician" Is New Name Applied to Radio Experts

"Radiotrician" is the name now being applied to men installing and servicing radio sets. Under the auspices of the Federated Radio Trade Association the idea of set installation and service only by men who have proven their ability has spread to all parts of the country. Use of the word is becoming prevalent in many midwestern cities where local radio trade associations have arranged for the education, examination and registry of men who service radio sets.

Brevities

Dover Manufacturing Company, Dover, Ohio, was host to several hundred hardware and electrical dealers in Pittsburgh, September 12. The meeting was held to promote understanding and optimism in retail trade, special emphasis being placed on the fact that benefits accrue from clean and honest merchandising. A similar meeting was sponsored by the Dover company in Cleveland during July. More than one thousand Ohio dealers attended, including members of the Cleveland Retail Hardware Dealers' Association.

Bureau of Standards Journal of Research is the name of a new publication by the Bureau of Standards, Department of Commerce. It contains the bureau's research papers and critical reviews in the fields of science and technology, and is comparable in interest and importance with the two series of research papers, heretofore issued, namely: "Scientific Papers" and "Technologic Papers." The new journal will unite the fields of pure and applied science.

General Electric Company has established a Merchandise Engineering Council at Bridgeport, Conn., for the purpose of encouraging and stimulating research and development in the field of electrical construction materials and appliances. The council consists of Howard R. Sargent, chairman; Carl M. Lynge, O. H. Van Amburg, E. H. Lewis and W. H. Skolfield, with Charles E. Wilson and W. Stewart Clark as members ex-officio.

Federal Radio Corporation has completed arrangements with Economy Engineering and Supply Company, Lahore, India, for the distribution of Federal receivers in the districts of Punjab, Madras and Bombay. Yog D. Ahuja, general manager of the Indian concern, is planning a sales campaign. Arrangements were recently completed with Berro-Bonfill & Company, Mon evideo, Uruguay, to act as Federal wholesalers in that country.

Lenk Manufacturing Company, Newton Lower Falls, Mass., has acquired the business of Arcade Manufac uring Company, Boston, manufacturer of sectional switch boxes, junction-box covers, ground clamps, and other electrical fittings. Equipment of the Arcade company will be transferred to the new Lenk plant at Newton Lower Falls, Boston district, where a complete line of blow torches is manufactured.

Kaestner & Hecht Company, one of the oldest in the elevator industry, has been under the control of Westinghouse Electric and Manufacturing Company since 1926, and will hereafter be known as Westinghouse Electric Elevator Company, Chicago. F. A. Hecht formed the company shortly after coming to this country from Germany 50 years ago. F. A. Merrick will be president of the new company.

Frink Corporation, manufacturers of reflectors and lighting equipment, New York City, has established executive offices and show rooms at 369 Lexington Avenue. Factory and engineering department of the company has been moved to the Frink Corporation Building, Queensboro Bridge Plaza, Long Island City, N. Y.

Chicago Transformer Corporation announces that production is under way in its new plant at 4541 Ravenswood Avenue, Chicago. Personnel of the organization, which is newly formed, consists of W. J. Leidy, president; Earle Knight, vice-president; Arni Helgason, secretary; and G. R. Blackburn, treasurer.

Iroquois Electric Refrigeration Co., subsidiary of the General Asphalt Co., announces that business of the company will be terminated as of December 31, 1928. The high cost and low competitive selling prices prevailing in the refrigeration industry do not indi-

cate satisfactory returns, officials believe.

Radio Corporation of America is building a new short wave plant on its Riverhead, L. I., property as a part of its 1928 building program. The equipment it will contain is designed to assume the greater burden of traffic that the company handles with Europe, South America and other points.

Benjamin Electric Manufacturing Co., Chicago, has published a comprehensive illustrated "Guide to Productive Lighting for Industry" for use of plant executives, superintendents of production, plant electricians and master mechanics.

Anaconda Electrical Manufacturing Company, 111 W. Third Street, is the new name and address of the Wichita Armature Works, 1826 S. Waco Ave., Wichita, Kans.

Volton Battery Company has liquidated its business, selling all labels, trade-mark, and raw materials to Diamond Electric Corporation, Newark, N. J.

Bantam Ball Bearing Company, Bantam, Conn., has completed and begun production in its new factory at South Bend, Ind.

Personals

E. P. Walsh has been appointed advertising manager of Splitdorf Rol-Iron Company, Detroit, subsidiary of Splitdorf-Bethlehem Electrical Company. He was formerly assistant to the president of the Continental Typefounders Association, Inc., New York, was at one time advertising manager of the Refining & Power Plant Equipment Company, and had been division superintendent of sales with the Remington Typewriter Company, New York.

Charles F. Goodwin has been appointed New York district manager of Monitor Controller Company, Baltimore, Md., succeeding Joseph F. Frese, now vice-president of the company. Mr. Goodwin has specialized in automatic electric control application for a number of years, being former vice-president of Naumer Electric Company, which handles considerable Monitor apparatus.

Jess Hawley, former treasurer of Newcombe-Hawley, Inc., and vice-president of the newly formed United Reproducers Corporation, has been granted a leave of absence until November 24 to resume his duties as head coach of the Dartmouth College football team. Mr. Hawley's Big Green teams have gained national prominence since he became coach in 1923.

Paul A. Kober has been appointed television engineer of the Daven Corporation, Newark, N. J. He was formerly assistant to Dr. E. F. W. Alexanderson, chief consulting engineer of Radio Corporation of America and General Electric Company in the development of television, and was the first Edison Lamp Works engineer of General Electric Company to receive a Charles A. Coffin Foundation award.

H. T. Melhuish has been elected vice-president of General Contract Purchase Corporation in charge of its radio division. He was formerly manager of sales administration of the Radio Corporation of America, and, prior to his recent appointment, was head of the radio division of the National Electrical Manufacturers Association.

Bernard Lester, assistant industrial sales manager of Westinghouse Electric & Manufacturing Company, has been placed in charge of the company's business relationships with architects, builders, building contractors, and manufacturers of machinery and motor-driven appliances. His headquarters are at 150 Broadway, New York City.

Herbert E. Young, for the last two years Eastern sales manager of Grigsby-Grunow Company, with headquarters in New York City, has been appointed general sales manager of the company.

Leon N. Wells, manager Tungar Sales, Central States General Electric Suppy Company, has been announced winner of the General Electric Tungar Battery Charger Contest.

A. H. Goss, chairman of the board of directors of Kelvinator Corporation, Detroit, has submitted his resignation. He was at one time president of the company.

Coming Conventions

American Institute of Electrical Engineers
Regional meeting at Atlanta, Oct. 29-31.

American Society of Refrigerating Engineers
Meeting at New York City, Dec. 3-5.

American Welding Society
Fall meeting at Philadelphia, Oct. 8-13.

Electrical and Industrial Expposition
Grand Central Palace, New York City, Oct. 17-19.

National Association of Practical Refrigerating Engineers
Meeting at Louisville, Ky., Nov. 20-23.

National Electric Light Association
Great Lakes Division at French Lick Springs, Ind., Sept. 27-29.
New England Division at South Poland, Me., Sept. 24-27.
Kansas Section at Wichita, Kan., Oct. 18-19.

National Electrical Credit Association
Annual meeting of Central Division at Chicago, Nov. 15-16.

National Electrical Manufacturers Association
Fall meeting at Briarcliff, N. Y., Oct. 29-Nov. 1.

National Safety Council
Meeting in New York City, Oct. 1-5.

W. P. Poynton, formerly with Le-Carbone Company, has been added to the staff of Boxill-Bruel Carbon Company, Columbia Park, Ohio, in the capacity of sales manager, according to announcement of F. S. Dewey, general manager.

H. W. Foulds, general sales manager, has been elected vice-president of Servel Sales, Inc., subsidiary of Servel, Inc.

D. R. G. Palmer is the new president of Safety Cable Company, division of General Cable Corporation.

Obituaries

John G. Pertsch, Jr., 40, professor of electrical engineering at Cornell University, was drowned in Cayuga Lake, Ithaca, N. Y., August 23, following a successful attempt to rescue a woman. Prof. Pertsch, who was educated at Baltimore Polytechnic Institute and Cornell, had devoted his entire career to academic work at Cornell, which institution he joined in 1909. In the summer he supplemented his teaching with practicable engineering work with the General Electric Company and the Westinghouse Electric & Manufacturing Company. He was a member of the Society for the Promotion of an Engineering Education and the American Institute of Electrical Engineers.

J. Byers Holbrook, 56, New York consulting engineer and formerly with the inspection department of the New York Edison Company, died August 20. Mr. Holbrook was a graduate of Cornell University, and had been connected with the E. W. Bliss Company, Brooklyn; Jenney Construction Company; and American Blower Company.

Richard T. Dana, 53, who conducted a private consulting engineering practice in New York City, died August 26, at his summer home in East Islip, Long Island. He was the author of several engineering works and was co-author of "Mechanical and Electrical Cost Data."

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City.

"L. R. Co." Receptacles.
"Patrician" Line of Lighting Fixtures.
"Splendida" Electric Iron.
"Sal Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Wharton" Battery Charger.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Blaisdell" Automatic Electric Cigar Lighter.
Address of Dura Electric Appliances, (Manufacturers of Curling Irons).

Anti-Friction Bearings in Electric Motors

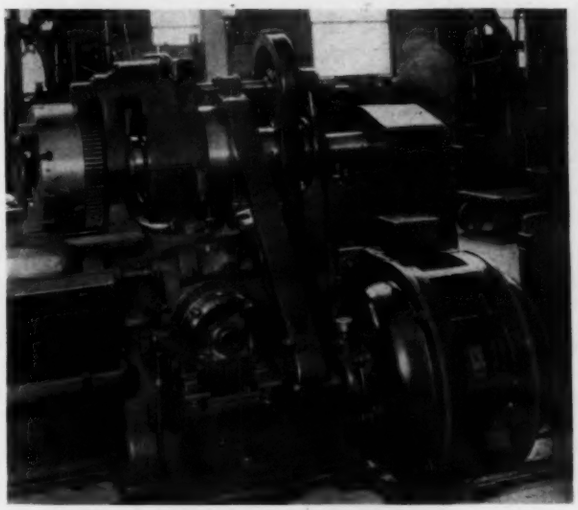
Some interesting examples of the application of electric motors having anti-friction bearings and a discussion of their advantages over other types

By W. B. Moore

Assistant Manager, Industrial Department, The Timken Roller Bearing Company

To the average user of electric motors the bearings with which they are equipped have hitherto been a matter of secondary importance, something to be more or less taken for granted. Motors were, and are, chosen for their work primarily on the basis of their electrical characteristics, their mechanical features hardly entering into the question at all. The development in the use of anti-friction bearings for motor service which has taken place over the past few years has brought about a considerable change in the interest displayed in the mechanical phases of motor operation, principally because of the light it has thrown upon the actual influence of bearings on motor performance. In brief, experience has shown that the bearings are a factor very much to be reckoned with, both from an economical and a practical standpoint, especially in the light of the possibilities for improved performance and effectiveness. Therefore, although the case for anti-friction bearings for motor service has been pretty thoroughly established by the results obtained, it may be of some interest to consider just what may be expected from their use.

Before going into the matter extensively it should be realized that, from a bearing standpoint, a motor is a purely mechanical device, its electrical characteristics can be practically ignored. Therefore, its bearing requirements are essentially the same as those of any machine, and may be reduced to matters of loads, speeds, and provision for lubrication. The advantages derived from the use of anti-friction bearings are also largely of a mechanical nature, although they do, of necessity, at times affect the electrical characteristics of the motor to some extent. Anti-friction bearings cannot be regarded by any means as a universal panacea for motor troubles, but they can be relied upon to eliminate the first causes of quite a number of them.

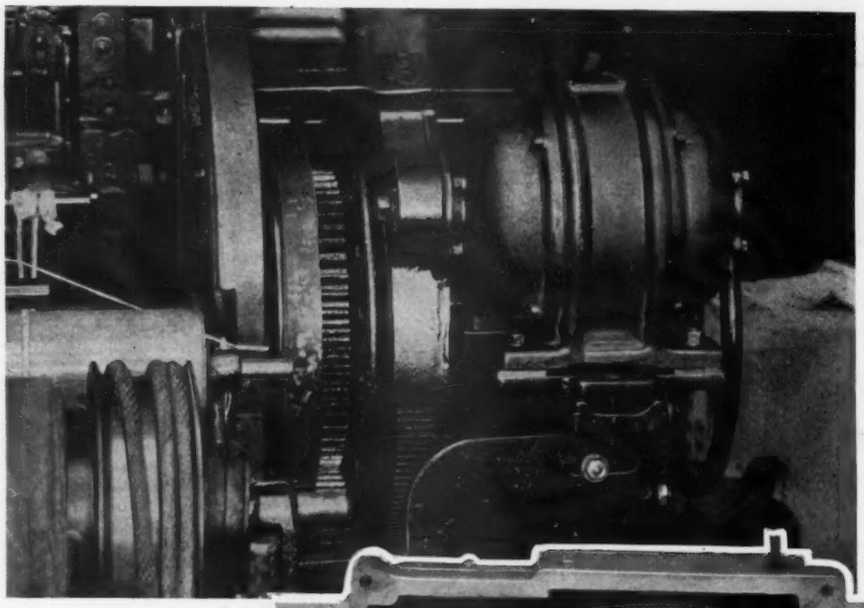


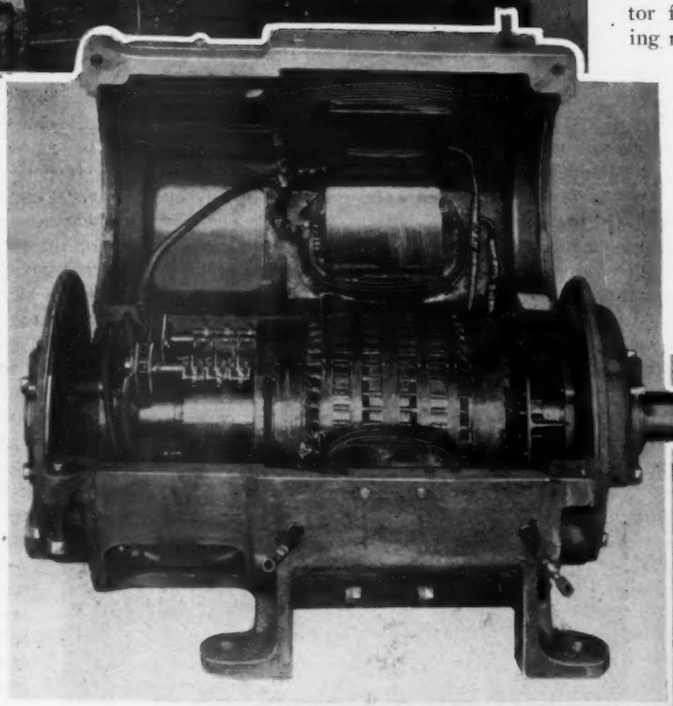
Where reduction in the overall motor length is important. An anti-friction bearing motor built into the head of a lathe

Probably the greatest service performed by anti-friction bearings is that of securing the continuity of the motor's service. It is fairly well conceded that the bearings are ordinarily, the most vulnerable point in motor construction, and that the outages and troubles caused by bearing failures are probably the worst as far as expense and interruptions to service are concerned. Normally, bearing failure may be caused by any one of several causes, the most common being wearing down of the bearing surface due to long periods of continuous running, or the presence of abrasive or other destructive material in the bearing chamber, or to insufficient lubrication either because of neglect, or failure of the lubrication system. In any event, the damage to the motor is likely to be such as to put it out of service for a considerable period of time, and make its reconditioning an expensive affair.

In the case of anti-friction bearings, the large majority of these troubles are eliminated. In the first place a properly designed bearing of this sort is not subject to wear from long usage, at least not to an extent that is liable to affect the operation of the motor during the natural term of its existence. And, secondly, anti-friction bearings permit of a closure design that will positively exclude all dust, or other foreign matter from the bearing chamber, practically regardless of external conditions. As to the lubrication feature, while the bearings will naturally work better when proper attention is paid to their lubrication, they will stand a certain amount of neglect without necessarily causing damage to the motor. There is another important point to remember in this connection. If an anti-friction bearing does become overheated from lack of lubricant, it will not continue to run until it is destroyed, but will seize and prevent rotation of the rotor to an extent that will operate the overload or thermal relays in the motor control, and shut it down before any real damage can be done.

Of next importance to the insurance of continuity of service is the increase in the effectiveness of motors which



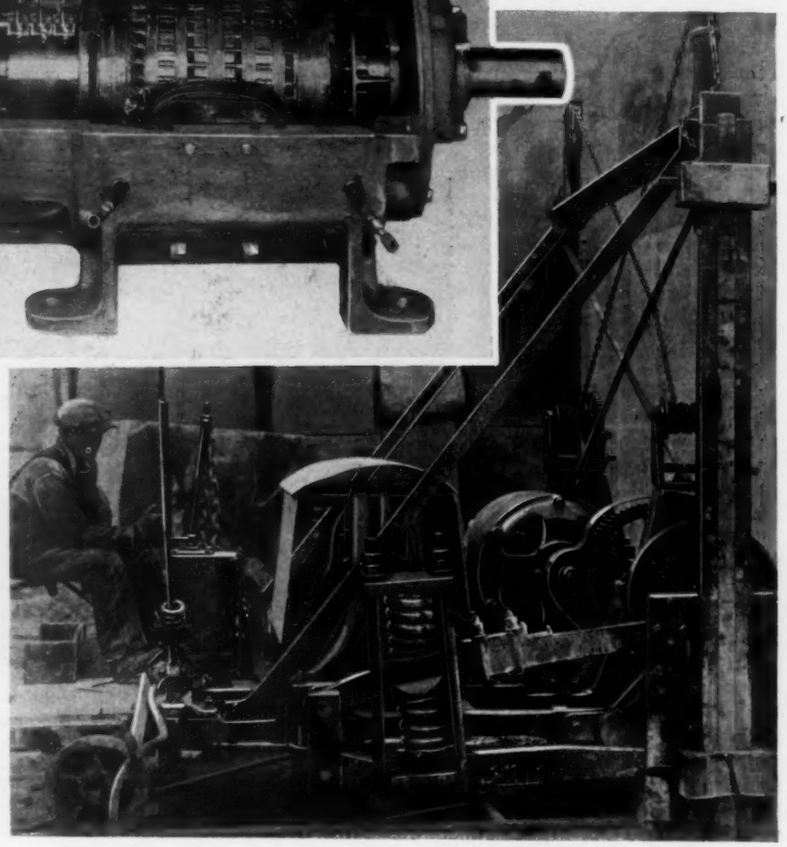


ABOVE is an example of an installation where overall motor length is again of importance. It shows an anti-friction bearing motor built into the head stock of a textile milling machine.

At the right is a view of a crane motor equipped with anti-friction bearings. The simplicity and compactness of the bearing housings and mountings are particularly noticeable at the ends of the motor

is directly traceable to the use of anti-friction bearings. For example, motor length is cut down, sometimes as much as fifteen per cent, due to the concentration of bearing area possible with anti-friction bearings. Sometimes this reduction in length is of no particular advantage, perhaps, it is not hard to imagine instances where it might be of material advantage, enough so to permit the location of motors where otherwise space limitations might prevent their use entirely. For example, where motors are built directly into machines, as is becoming very common practice, a saving of such magnitude in the overall length of the motor might be a deciding factor in its selection, or, under conditions existing in textile mills, or in other applications where it is necessary to crowd motors and machines closely together, a considerable saving in space is effected by anti-friction bearings. In fact a good many cases might be given where this particular feature works to the advantage of the motor.

Another way in which anti-friction bearings increase the effectiveness of motors is by rendering them suitable for applications where otherwise some conditions of the service would render them impractical, if not altogether out of place. As a concrete example of what is implied by the foregoing, take the case of a group of rock channeling machines working in a middle western limestone quarry. The vibration and shocks to which the motors driving these machines are subjected are so severe that plain bearings were literally hammered out of shape in a very short while. Removing the motor from the machine for bearing replacement was not only an expensive and tedious proposition, but it was a decided drawback to production to have a machine out of service while the motor was being repaired. After several experiences of this sort the operators of the machines specified motors with tapered

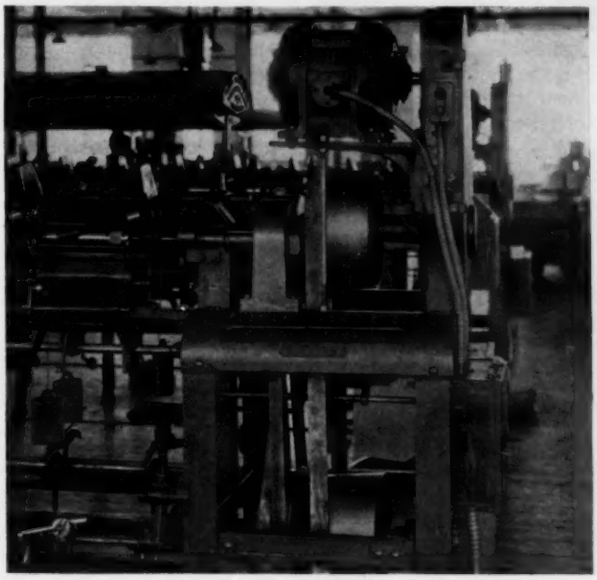


A motor equipped with anti-friction bearings driving the tool and trolley motions of a rock channeling machine. Shocks and vibrations are excessive in such machines and have a decided wearing effect on bearings

roller bearings, with the result that the entire maintenance expense, and delays caused by bearing failures was completely eliminated. There are many other kinds of installations where conditions are somewhat similar, and where the motor with anti-friction bearings is infinitely the more suitable, if not the only practical one to use. Another type of installation where the anti-friction bearing motor has the advantage is that in which motors are so located that lubrication at frequent intervals is an inconvenient, or perhaps even impractical matter. Numbers of installations of this sort could be cited, a few will serve to show what is meant. Isolated pump motors, motors on the travel mechanism of cranes, those driving elevators in grain elevators, or those used in more or less inaccessible positions in quarries, or mines are a few examples.

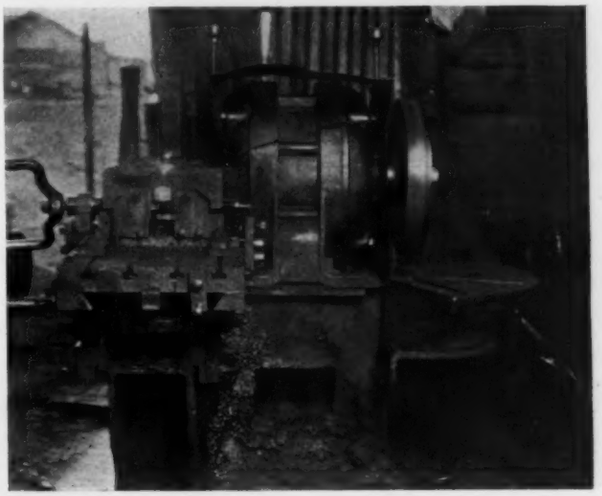
The superior lubrication qualities of the anti-friction bearing motor are also of value in industrial applications such as textile mills, or flour mills, or any sort of factory where dripping oil is liable to cause spoilage of the finished product. Because of the fact that, in the first place, anti-friction bearings lend themselves remarkably well to grease lubrication, and that the closures can be made tight, there is little danger of the product becoming contaminated with oil, or grease from the motors. The same feature permits the mounting of motors in overhead positions, either wall or ceiling, upside down or sideways, without any lubrication difficulties as a result. The anti-friction bearing motor is also eminently suitable for work in service where it is subject to tilting, as on shipboard for example, for substantially the same reasons that have just been stated.

So much for the practical side of the question. The economic side is of equal interest, although the influence of the bearings economically extends over more than the purely mechanical features of motor operation. The most obvious saving is, of course, that effected in the expense for both the time and material necessary for proper lubrication. Due to the characteristics of anti-friction bearings, and their closures, that have already been described, the volume of lubricant used by a given motor over a given period is comparatively small. In addition, renewals are necessary only at infrequent intervals; as a matter of fact tests conducted for the purpose under actual service conditions have proved that, on what may be called average service, motors will run from three to six months on the initial supply of lubricant. The result is that in plants using large numbers of motors the savings, both for lubricant and the time and labor necessary to apply it, may very easily amount to a considerable sum in the course of a comparatively short space of time.



A mounting for a textile machine motor that is possible by the anti-drip properties of motors equipped with anti-friction bearings is shown in the illustration above

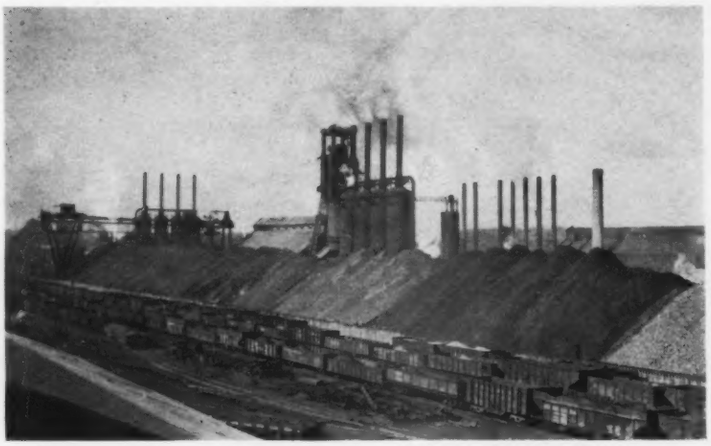
Aside from the economic benefits that follow as a result of continuous service from motors, and which are too obvious to require much explanation, the use of anti-friction bearings effects savings in another phase of motor operation. This is the matter of maintenance. By eliminating, or at least indefinitely postponing the possibilities of troubles that follow bearing wear, the anti-friction bearing greatly reduces both the time and labor that is ordinarily devoted to motor maintenance. This feature increases in importance in direct proportion to the severity of the service in which the motor is engaged. One case of this sort has already been explained, another may serve to clinch the statement. The particular case in point concerns a group of motors working in a steel plant. The atmosphere surrounding them was literally filled with emery dust, a condition that, under ordinary circumstances would lead to frequent bearing trouble and expense for reconditioning both motors and bearings. As it is, the motors being equipped with anti-friction bearings, maintenance charges during the three years that they have been operating have been practically negligible, consisting mostly of labor charges for periodic inspection of the motors and bearings. This leads up to a subject of some importance, the beneficial results of a reasonably careful system of inspections as an aid to keeping down maintenance expenses. Even anti-friction bearings are not infallible, especially where their simple maintenance and lubrication requirements are not thoroughly understood. By such a procedure what few potential causes for trouble that do exist can be found and remedied before they have had time to do any damage. It might be said in this connection that a thorough inspection of an anti-friction bearing mounting in a motor is a very simple matter, much more so than that of a plain bearing mounting.



Operating under difficult conditions. Driving a hot-saw in a steel plant directly with a motor having anti-friction bearings

Such then is an outline of the case for the anti-friction bearing. The statements that have been made no longer rest on theory, they are thoroughly borne out by records made in actual service in all sorts of industrial installations. Summarized, the whole situation may be stated thus: by strengthening the weakest point in motor construction, the anti-friction bearing completes the protective system that is provided to safeguard continuity of motor service. The other benefits that characterize the use of such bearings follow as a matter of course.

Iron and Steel Castings—Their



No. 6 of a Series of Articles on Common Materials

A typical Pennsylvania steel mill showing a blast furnace in the center and another at the left, with the ore and fuel dumps in the foreground. Notice the Gantry crane at the extreme left which is used for handling materials

FERROUS castings, whether the conventional gray iron product of the foundryman's cupola or whether of steel that has been freed of impurities in the electric furnace and by subsequent heat-treatment made fit for more exacting service, constitute one of the most important items among the commodities consumed by the electrical manufacturer. While some of the large electrical manufacturers operate their own foundries, others of equal prominence find it more advantageous to patronize specialty foundries, and the aggregate volume of electrical business enjoyed by the latter is very close to the top of their consuming outlets. Domestic appliances, such as electric air heaters, fans, refrigerators, ranges, and the like, call for a large quantity of parts that can be most economically cast, and in the field of heavy electrical apparatus, such as motors and generators, bases, frames or housings are iron castings. Magnet yokes, bearing brackets, bracket arms, rocker arms, end plates, spiders, bodies, wheels, rings, flange fittings, boxes, covers, transformer cases, switch cases, conduit boxes, brush boxes, and many kindred devices are cast iron. So are most street-lighting standards and the pedestals of many traffic control signal units. In fact, iron castings are used as bases for a wide variety of indoor and outdoor lighting fixtures, and bases of searchlights.

Materials for the Making of Castings

BEFORE presenting the salient characteristics of the three classes of ferrous castings: gray iron, malleable, and steel, the raw materials from which they are made deserve brief consideration. Gray iron castings may be made of virgin pig iron or of a mixture of the latter with scrap. The scrap may have originated in the foundry, consisting of defective castings, sprues, gates, etc., or it may have been purchased in the open market in which discarded machinery parts, stove plate, and worn railroad car-wheels, are always obtainable in round tonnages. The base grade of blast furnace iron used in gray iron castings is No. 2 foundry. Pig iron is classified according to its chemical composition, silicon content being the major quality and price factor. The average silicon content of No. 2 foundry iron is 2 per cent, this element determining to a large extent the freedom of castings from oxides and blow-holes and also increasing the fluidity of the melt.

There are those who stoutly maintain the superiority of a casting made entirely of blast-furnace metal over that in which a large percentage of scrap has been used. Theoretically, uniform scrap of high quality should yield at least as sound a casting as any made entirely of blast-furnace metal. Remelting never fails to benefit any metal, and it is due to recognition of this fact that American practice has never favored the making of castings at blast furnaces. The difficulty the use of scrap entails to the foundryman is due to the heterogeneous character of most scrap iron shipments. They are graded to the full extent which such a tonnage commodity permits, but the close control that some fastidious foundrymen aspire to is, of course, made very difficult when part of their raw material has a wide variation in its origin. And yet, foundry practice, as distinct from metallurgical theory, has developed among veterans of the craft a sixth sense by which they can intuitively judge the characteristics of a certain shipment of scrap, and, by using much or little of it in keeping with the particular requirements of a certain casting, obtain results that play havoc with the notion of there being any special virtue in a casting made from iron as it comes from the blast furnace. Moreover, practical foundrymen look upon a certain percentage of scrap as an antidote against shrinkage difficulties. At times there are also complaints that, in spite of pig iron being generally sold by analysis, the product of many blast furnaces runs rather poor, and scrap is then resorted to as a corrective. Cost is also a factor, and while the price of foundry scrap is made by that of the virgin metal, the normal spread between the two is a consideration which the foundryman can not ignore when his customers look upon castings as a tonnage product which they expect to buy on the basis of the going price of pig iron plus a small conversion charge. This attitude may possibly do for consumers who use nothing more intricate in the way of castings than sash-weights, but where physical and mechanical properties count for something, castings must be judged on a different basis, and the gray iron industry is now hard at work to convince consumers that it is to their own benefit to support the change from a pound to a piece basis which will enhance standards of quality.

How Castings Are Produced

MALLEABLE castings are made from malleable pig iron, usually with the addition of malleable and heavy steel scrap.

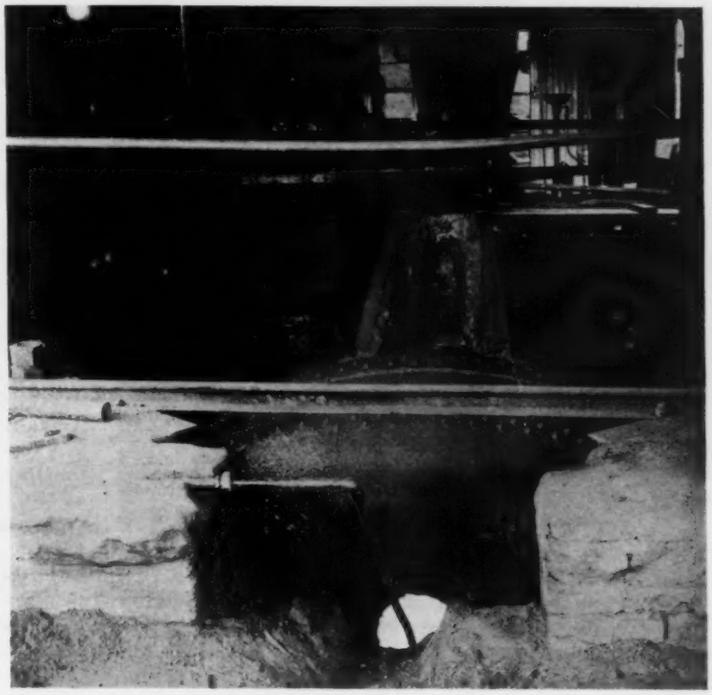
Steel castings comprise so great a range of products made by different processes that the raw materials used differ widely, their choice depending upon the character of the product desired and the process employed. In addition to different grades of pig iron and iron and steel scrap, ferro-alloys enter into the production of many steel castings.

While cupola melting is the ordinary procedure in gray

Uses in the Electrical Industry

Alloy steel castings are of special interest to the electrical manufacturer. Manganese steel stands alone where hardness and resistance to wear are essential. Nickel steels will sooner or later be available in the form of castings for motor frames

By W. C. Hirsch



Molten metal being discharged from a blast furnace into a receiving reservoir. The molten metal is flowing through the trough in the ground in the center of the illustration and the opening in the reservoir may be seen at the back of the illustration above

iron foundries, it is not the only one. A cupola is best described as a kiln in which the metal mixtures are placed on a bed of coke or some other fuel and melted in the presence of air blasts to maintain the glow of the fuel. A more improved melting method is that furnished by the air furnace where the charge rests upon an inclined hearth and the metal does not come into direct contact with the fuel. Still further along on the road of progress is the open-hearth furnace, and there has been much discussion in recent years concerning the use of the electric furnace in the production of gray iron castings. As a stepping stone toward the electric furnace, which entails a relatively heavy capital investment, a Norwegian foundryman who visited the United States last year, suggests the combined use of the cupola and an electrically heated forehearth to superheat, deoxidize and desulphurize the metal.

Molding machines, generally operated by compressed air, make possible continuous operation in the gray iron foundry. A good many refinements have been developed in connection with this equipment, especially along the line of labor-saving conveyors. Similar progress has been made in the making of cores, which like the molds are of sand and set inside the mold proper to assist in forming the metal, the most common use for them being to provide a hole in a casting, such as the inside of a cylinder or the bore of a pulley. Not only have molding sands been thoroughly studied, but so have the binders used in cores, consisting of gums, pitches, oils, colloidal substances, etc. The cores are baked and after they have been assembled into the molds, the pouring of the castings into the latter takes place. When taken from the sand, the castings are cleaned. Small castings are cleaned in tumbling barrels which contain star-shaped pieces of metals. Many castings are cleaned by sand-blasting. Castings that are to be finished by galvanizing, enameling, or kindred processes are pickled.

Characteristics of Malleable Iron

MALLEABLE iron castings owe their popularity chiefly to heat treatment. The process consists essentially of freeing the iron from graphitic carbon, when cast, and by heat treatment bringing about the conversion of the combined carbon into "temper" carbon that exists in small spots or patches. The latter do not break up the continuity of the iron matrix as do the large thin plates of graphite in gray iron castings. In the manufacture of malleable castings, the electric and air furnace have completely displaced the cupola which was in use in the earlier days of the malleable iron casting industry. Annealing furnaces of large capacity are one of the features of typical malleable foundries, the annealing boxes being so arranged that the flames may play around them as completely as possible. Malleable iron foundries guarantee an excess of 50,000 pounds tensile strength per square inch and more than 10 per cent elongation in two inches in their castings. Users of malleable castings sometimes attempt to subject them to a heat treatment of their own, and in doing so jeopardize the properties imparted by the original heat treatment at the malleable foundry.

Manganese and Nickel in Castings

WHILE the electric furnace furnishes the highest quality of steel castings, other processes come in for consideration because of special reasons. Basic and acid open-hearth furnaces permit of tonnage output at a relatively low cost, while the Bessemer furnace has a relatively low initial cost of installation and also relatively low operating costs. The crucible process permits of great flexibility, and is, therefore, eminently suitable for the production of high-grade castings in small quantities. Both the electric furnace and the crucible method of production lend themselves admirably to the production of small castings. Just as in the case of malleable castings, annealing plays an important role in the manufacture of steel castings. In fact, the steel treater can add considerably to the quality of high-class castings by broader application of his science than what is understood by annealing.

Of special interest to the electrical manufacturer are alloy steel castings. Manganese steel stands alone where hardness and resistance to impact wear are essential. Nickel steels, now available in bar form, will sooner or later be

available in the form of castings for motor and generator frames. Steel foundries are making castings of high nickel-chrome steels of the heat resisting type, and in this conection it is interesting to note that nickel and nickel-chromium are coming in for more and more attention as alloys in

Pouring molten cast iron into molds. These are rows of metal molds on endless conveyors that pass under the ladles and the castings are in the form of "pigs" used for making cast iron and steel castings and other steel products

gray iron castings. Nickel improves the machinability of the iron casting, aside from adding to its strength, toughness, and wear resistance. For nickel-chromium as an alloy in gray iron castings a remarkable increase in resistance to fatigue is claimed.

Special care in specifying the properties of castings must be taken when they are intended for supports for A. C. motors and generators, so as to obtain material that will minimize the hysteresis loss as much as possible.

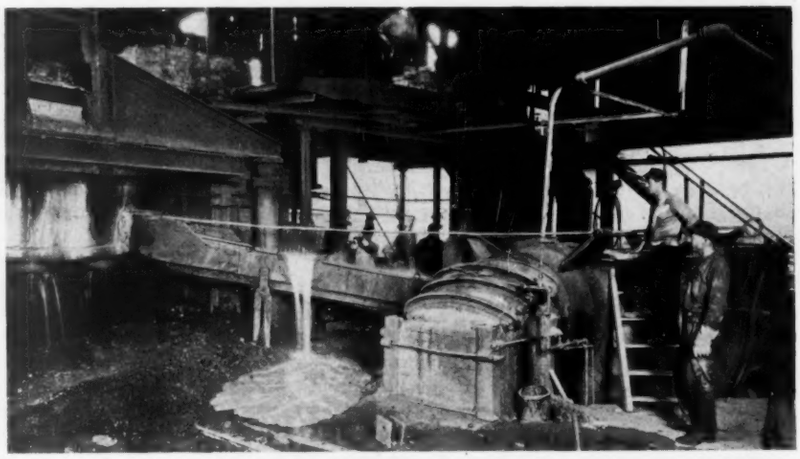
While the American Society for Testing Materials has formulated comprehensive specifications covering nearly all forms of castings, progressive foundrymen go much further than mere compliance with minimum specifications and really offer to consumers of castings a service that is of the greatest value to manufacturers without a foundry specialist in their employ. This service goes so far as to entail a study of every new casting pattern with a view to decreasing machining costs and increasing the casting's wear. To enable the foundry experts to accomplish best results along these lines, it is, of course, necessary for them to be fully informed as to the functions in the completed unit of the casting. Very often the foundryman can be of inestimable help in suggesting more suitable metal composition, and heat treatment for the duty which the casting is called upon to perform, and more economical design without in the least interfering with the ideas of the electrical engineer and without lowering the serviceability of the assembled product. Some foundries make a test casting of every pattern and hack this test casting to pieces to learn its defects and they keep on doing this until they are sure that a perfect casting has been obtained and that this degree of perfection can be maintained in mass production. Transverse and tensile tests and chemical analyses of castings serve an excellent purpose, but in the very last analysis the most helpful factor in the relations between the foundry and the electrical consumer of castings is the sort of close cooperation that comes from the willingness of the latter to pay the former a living profit in return for which he can expect that invisible service which often counts for far more than the mere passing muster of the castings. The national organizations of the gray iron, malleable, and steel foundries are all striving to bring quality and service to the fore.

The importance of the iron and steel business with respect to the production of castings becomes more significant when the magnitude of the industry is taken into consideration. Its effect is felt in the commerce of the world and in the United States it is one of the most important of the manufacturing industries. Its branches reach into every State in the Union, supplying gainful occupations to millions of workers. These are not alone engaged in the production of castings but are occupied in many of the fields affected by the iron and steel business.

Mining, for example, engages hundreds of thousands of workmen who produce the iron ore, the coal for smelting it and the fluxes used in the making of pig iron and steel. The ore comes principally from the Lake Superior regions, the Birmingham, Alabama, district and some parts of the eastern Atlantic States. Coal is obtained from the mines in the central part of the country and from the Pennsylvania district, while the fluxes are obtained from practically every State in the Union.

All of this material must be transported to the steel mills and foundries where it is converted for industrial use. There are some 600 blast furnaces in the United States, according to the best available data, and these produced in 1925 upwards of four billion dollars' worth of products. In the production of pig iron alone 371 furnaces turned out over forty million tons of castings in 1926, and to do this required the use of approximately thirty-eight million tons of coal and twenty million tons of limestone, the latter being used as flux for smelting the ore.

The production of steel ingots and castings in 1926 was somewhat higher than that of pig iron, in that forty-eight million tons were manufactured. And, while only the nominal amount of twenty-eight thousand tons of pig iron was exported in 1926, some five hundred thousand tons of cast iron was brought into the country for the production of iron and steel of many different kinds. Of course, it must be understood that all cast iron is not used in the production of castings alone, for a large part of it goes into the making of steel sheets, rods and structural shapes.



Charging a Fernot furnace in the course of refining the metal for making steel castings. Molten metal is drawn from the blast furnace at the left and passes into the Fernot furnace at the right. Some of the hot metal is seen spilling over the trough

The Place *of the* Professional Business School in Industry

An outline of the procedure and importance of professional schools of business and their relation to the industrial world as an aid in the solution of its operating and management problems

By Deane W. Malott*

Assistant Dean, Graduate School of Business Administration, Harvard University

THE world is moving very fast, and it is difficult for most of us in the complexities of our daily life to back off sufficiently far to obtain a view of the broader perspectives, and to see the underlying trends of business progress. Science, progressing more rapidly in the last 25 years than in a like number of centuries, has surrounded us with an entirely new environment, bringing to our doors conveniences and luxuries undreamed of by our pioneering forefathers.

Thirty years ago the automobile was only a possibility. Since then we have been still more closely brought together by the airplane and the radio, and men have gone to the ends of the earth in search of new lands and resources. The last 25 years has seen the greatest experiment in government of all time, in the Bolshevistic experiment in Russia. Turkey and China have had their awakening. In a thousand ways the engineers and scientists have been molding the destinies of man.

Schools Study Industrial Problems

IN the field of business have come the most extraordinary changes, as the business man has taken hold of scientific achievements and made them available to you and me. Great business organizations have arisen, in countless numbers, calling for the highest genius, without which governments would fall and scientific discoveries be rendered useless. And it is not surprising to find the development of schools of business devoted to the study of these tremendous problems which the business man is facing.

Fifty years ago the profession of law had discarded the hour-glass method of apprenticeship training in favor of the school of law, which is now the accepted portal through which all who practice the law must pass. Similarly the school of medicine has supplanted the old time method whereby the student drove the rounds with the general practitioner in a laborious effort to pick up from observation enough knowledge to begin the practice of medicine.

But business has been peculiarly slow to carve out for itself a means of training its man power. Yet in business lies one of the oldest of men's efforts together even before the dawn of history business had started upon its work.

While warring tribes were attempting to exterminate each other, trade built the roads of commerce, and established an exchange of goods and ideas. And today, business is becoming aroused to the importance of the intellectually trained man. As a great business leader has expressed it, "Scholars are now finding their way to the factory site as they have heretofore to the pulpit, to the law courts, to the hospital, and to the forum. And likewise, men of business will come back to the halls of learning and give from the wisdom of their experience in the upbuilding of their profession."

The reasons for the rapid growth of schools of business are not obscure. With the dissolution of the army in 1919, men who had been trained in the pursuit of war, recognizing the advantages of specific intensive training, sought entrance to the business school as a preparation for their life work, with the result that twice and three times the expected numbers sought admittance to the schools of business in that year. Then, too, with the growing complexity of the business unit has come the need for trained men to fit into organizations where one man's capital, labor, and knowledge are not sufficient, as they once were, to direct the business efforts. The organization has not always functioned well, and even today we have great problems yet unsolved, which are calling for all the intellectual power, all the idealism, and all the sportsmanship, which we are capable of producing.

Ethical Standards Govern Business

HENCE, business schools have taken a place in the educational scheme of things and give promise of having started on a career of importance to business. Now, what may you men of industry expect from this educational mushroom? We hear rumors, and occasionally see something in print, concerning the new profession of business, and we have come to realize that the world needs sadly this new profession. But the visibility is low, so to speak, and we see obscurely into the meaning of the term. Obviously, there have been many professional men of business, but it is safe to say that business the profession is only now emerging. Its problems and tasks, however, have not waited at all. They loom large on the business horizon.

The difference between the old-time business and the emerging profession of business today is the result of the effort to establish guiding principles, underlying fundamentals, recognized by the leaders of industry and trade, as being the guides to navigation in a previously uncharted sea. It is the result of the emergence of ethical standards governing accepted practices and methods of procedure. It is the result of a rising consciousness of the social re-

* *Excerpts from an address delivered by Deane W. Malott at the convention of the National Electric Light Association, at Atlantic City, June 4 to 8, 1928.*

sponsibilities of the business man, along with his business activities. These together are weaving the enduring web of a business tradition, to the pattern of which each leader of industry may contribute the example of his efforts.

In the upbuilding of these professional aspects, business education must assume a leading part if it is to fulfill its prophecy of service. But the graduate of the business school is no more a full-fledged swivel-chair business executive than is the interne from the medical school a skilled surgeon, or the graduate of the law school a seasoned court lawyer. Experience and judgment, a knowledge of the particular technique, and the confidence of his fellow-man, are important ingredients to be added when he has left the academic halls, and may require years to attain.

Research Men Are Constantly Seeking Data Concerning Business Problems

WHAT then is the object of the training offered by the schools of business? We are all attempting in the first place to teach men to think. At Harvard we have substituted, for the method of teaching by precept, the analysis and diagnosis of actual problems collected from business.

Our research men are constantly at work seeking out from business men, data concerning the actual problems which face them. In the discussion of these problems the student arrives at a reasoned judgment, and underlying economic and business principles are brought out where possible. In the course in public utility management, for instance, the problem of regulation is approached from the actual court and commission decisions, and the question of rate determination has as its basis actual problems surrounded by the necessary facts and theories for its determination. The student thus acquires a method of approach, of far more importance that the facts themselves, for business is dynamic and facts as they exist today will not hold true in the day in which these young men assume their responsibilities in industrial affairs.

But the relation between the schools of business and industry goes far deeper than the training of young men for business life. From you men and from those in other fields must come the teaching material, and the soundness and wisdom of our instruction is in large measure dependent upon your cooperation in allowing us to keep in constant touch with the measured tread of progress in industry and trade. No school of business, if it is really to serve industry, can be a thing apart from business activity. Our research men are constantly in the field, and in the process of obtaining teaching material we are building up for you an ever growing background of economic data which may guide you on your way. And the men of business have been everywhere cooperative and generous of their time and strength not only in giving us often the intimate details of their problems, but in bringing personally into the classroom their counsel and experience.

Industry Supports Business Schools

THEY have given financial aid to the development of business research and teaching. Trade associations and individual business concerns and business men have practically supported the research work of the Harvard Business School, which is providing teaching material for more than a hundred other business schools throughout the country. The students can through their tuition, pay the instructional costs, but obviously the costly research necessary to provide teaching material in the various fields of business cannot be covered by tuition charges, and can come only from the far-visioned leaders in industry who realize the importance for the future in the intellectually trained man.

Within the last five years public utility instruction has been added to the curriculum of the Harvard Business School. In this audience are many men from concerns which for the last three years have been giving their financial support to the development of public utility management teaching and research in the Harvard Business School, and you may be interested therefore in a report of progress. This money has been spent to help pay for instruction in a course in public utility management, advice concerning which has never been sought from nor given by those contributing to this support; to collect several hundred actual problems, from commission and court decisions and from concerns in the public utility industries—all factual incidents reported for class use and published as a collection of cases; and to produce a detailed and inclusive factual study on "The Interstate Transmission of Electric Power," published without comment as a compilation of facts, and of specific use to us as teaching material. Wherever material resulting from our studies is of direct and immediate interest to the business world, it is made available, and factual studies are published from time to time.

This is not only typical of our relations with other industries, where in several different fields groups of business men are helping us in the furtherance of knowledge and research, but I believe is typical of the sort of effort going on in other professional schools of business. And the support of this industry and of other industries to the professional schools of business has made possible the development of intellectual training for business, the establishment of business principles, and a basis for creating a professional motive in the young men entering business, which otherwise would never have been possible.

Trusted Men Needed in Business

NATURALLY, funds come from the larger units and groups in industry—from those groups where power is often associated with some sinister purpose.

The "soulless corporation" is constantly held up as the great example of unethical operations, although seldom is it deserving of this characterization. The large corporation in its process of development generally tends to elevate itself to higher ethical standards, and there inevitably creeps in more of a feeling of trusteeship, not alone for the security holder but for the employee and the community as well. This ethical evolution goes on because through the years a large organization must be reasonably trustworthy in its complex internal operations in order to continue to conduct the business service which is the purpose of its organization. It must, therefore, choose trustworthy men for its organization, and a group of men who so conduct themselves that their associates can trust them will over a period of years be the type of men who are trustworthy in dealing with their public. We are all more sure of an honorable trade with the great national corporation than with the man in the fruit stand at the corner. Moreover, the big corporation generally emphasizes stability and permanence, rather than immediate profits, with the result that its policies are determined for the long run, and more consideration is given to factors of ethical importance.

Schools Have Research Organizations

MOREOVER, it has long been recognized that sound business practice must rest on firmly established research into the facts and economic principles of business. A concern which operates its own research department is looked upon as outstandingly progressive in bringing to its highest fulfillment the service it offers to the public. It certainly is no less far-visioned to make possible through financial support industrial studios by the schools of business, where adequate research organizations are set up, away from the firing line of conflicting motives and prejudices, and where men are dedicated to the search for truth.

It is also an accepted principle in the development of business to build up public recognition through advertising and

to attract the most capable men into the industry. Certainly it is in keeping with this policy to provide ample opportunity for the training of young men in the problems of the industry, in the schools of business. Young men are challenged by the problems which business offers.

Let there be more and still more cooperation, therefore, between industry and the schools of business; for the opportunities are legion and time is running against us. Two hundred years of adventuring in the realm of science has opened constantly new and larger opportunities for progress and for the culture and comfort of modern civilization. Owen D. Young, at the dedication of the buildings of the Harvard Business School a year ago, said: "I can see a picture of the adventurers in pure science moving out into unknown fields as the great geographical explorers set sail for unknown lands. Following them are the applied scientists learning how to use the new forces, just as the early settlers followed the old adventurers. Finally, business organizes itself to harness these forces and put them to work. Never were opportunities so great as now. Never did unexplored areas seem so vast. Never was there a more responsible trusteeship needed for the discovery of new opportunities or for the administration of existing powers. We need today, more than ever before, men to administer this trust, who are not only highly skilled in the technique of business—men who have not only a broad outlook in history, politics and economics—but men who have also that moral and religious training which tends to develop character."

Business Relations With the Public

THIS is a challenge to the combined efforts of schools of business and industry. If it is to be met we must develop men fundamentally capable of meeting the social responsibilities which business men more and more will have to assume. Religion is fraught with dogmas, political leadership is losing ground, science has created a materialistic world, and on all sides complicated questions of social relationships press for solution, and the leaders to attack these problems are strangely missing. Yet the social responsibility of the business man is inescapable. It involves the job of raising industry itself, from within, on a higher ethical plane—a plane which is not socialism nor communism, nor government operation or the exercise of the police power, but rather a great development from within the business itself of a sound and effective control of industry, its relations with labor, with its customers and with the public.

Yet progress will be slow, because business still lacks the requisite intellectual background of rigorously trained men. You in the public utility industry do not know enough about what happens in the other man's business, what the guideposts of precedent are, what the fundamental theoretical and economic aspects are. You do not know enough of the elements of competitive trade which are applicable in these fields.

Business Schools Have Summer Sessions

HERE again the schools of business may lend their cooperation. The Harvard Business School has organized for this summer a "Special Session for Business Executives," where business men from all parts of the country are congregating for a six weeks' intensive study of business subjects. This venture is based upon our experiment last summer in a course for public utility men, and its apparent success warranted an expansion this year to include not only public utility management again, but also finance, wholesale marketing, retail marketing, and transportation. Here men will gather from the various industries of the country to discuss the actual problems of business, to study underlying economic principles, and outside the classrooms to mingle in intimate discussion, freed from the problems which constantly press them at their own desks. The success of these courses depends upon the vision of business men who see the broadening advantages for their junior staff in such an undertaking. Upon the cooperation which industry accords this plan will depend the future continuation of this sort of effort.

But lest you feel that I have been leading you through a somewhat ephemeral idealism in tracing the opportunities of cooperation between industry and our universities, I can readily suggest some of the problems which our mutual effort must undertake in this emerging profession of business. Among the many problems arising out of new scientific developments is the far-flung labor problem, requiring for its solution far more knowledge and consideration of human relations and of the physiological and psychological motives for the actions of men. As a part of this problem we find the fear of losing the job, and of unemployment, so deeply ingrained in the mind of the laborer; the possibility of extending sound social programs into the living conditions of men, avoiding both paternalism and pauperization, and relief from the monotony of routine and the restoration of pride to the workman.

Decrease the Cost of Distribution to Lower Prices to the Consumer

WE must decrease the costs of distribution and thereby decrease the widespread discontent caused by the great difference between producers' selling prices and consumers' costs. Ways must be found for ironing out the business cycle, thereby eliminating devastating periods of recurrent speculation and depression, with their corollary problem of unemployment. Certain problems of corporation control must be studied, to the end that the spirit of trusteeship on the part of corporate managers may be in some cases brought about and in others strengthened. A definite spreading of the social point of view should serve as an incentive for men with wide business background to take an active interest in governmental affairs, as many lawyers formerly did, and not narrowly because their influence upon legislatures may result in the furtherance of their special interests.

The Cooperation of Schools and Industry

THE cooperation of business schools and industry is no easy task. It calls for breadth of view, for perspective and for patience. Problems of right and wrong arise with such constant frequency that the need for careful thinking and high standards is especially great. You men in business are constantly dealing with moral issues. The moral strain to which the young man is subjected in entering the ministry, medicine, or teaching, is far less than in law or business. Material success is a temptation for which we may too readily subordinate the ethical and cultural aspects of life, and this temptation is far greater in business than in the other professions. On the other hand, if one realizes that all types of service which are open to the young man entering the other professions are also open to the young man entering industry, there is a tremendous challenge to maintain youthful idealism and sportsmanship which will contribute tremendously toward the solution of the problems of the next few generations.

Stevenson somewhere has said: "You can make no one understand that his bargain is anything more than a bargain, whereas in point of fact it is a link in the policy of mankind, and either a good or an evil to the world."

Let us take as our common objective, then, the promotion of knowledge and integrity in the art of industry, in the upbuilding of manufacture and trade—which President Lowell of Harvard has aptly characterized as "the oldest of the arts, but the newest of the professions."

How to Use Current Business Statistics

(*Continued from page* 113)

those for the industry as a whole, to determine the exact standing of any company in that industry.

The third section of the booklet outlines how to interpret business statistics. This section deals also with almost every branch of industry such as production, material markets, exports, imports, employment and the like, and at the same time explains how figures from other industries may be made applicable to any one enterprise. In the fourth section of the pamphlet is an explanation of how statistics are collected and compiled, with specific directions as to the manner of obtaining absolutely correct information. This section also treats of the objections to the reporting of business facts, and at the same time attempts to explain away many of the more common of them.

While there are many sources of business statistics such as trade associations, financial institutions and commercial agencies, the principal source at this time is the Department of Commerce. Recognizing that there was a need for such information, former Secretary Hoover established the Survey of Current Business in 1921, to collect all available statistics under one cover for the guidance of business executives and to provide a medium for the extension of these facilities. The public now has the benefit through the publications of the Survey of Current Business of over 1500 separate indicators of business trends, and the number is constantly increasing. Not only does the public have more figures and in more available form than ever before, but the data are usually more representative than in the past, before they were compiled and better explained. But, inasmuch as the collection, compilation and distribution of this information by the Department of Commerce is relatively new, and in order that the information may be made more valuable to business executives, it was deemed advisable to direct their attention to its importance and at the same time explain the value of statistics and how they were used. And, as there are some 1500 kinds of different data published it was practically necessary that this information relative to the use of statistics be published in booklet form, which is the principal reason for the pamphlet by Mortimer B. Lane, "How to Use Current Business Statistics," which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The Trend Toward Color in the Home

(*Continued form page* 115)

which the problem at hand is regarded, to the end that if color is thought to provide a vehicle for the expression of personality or personal taste, then the question resolves itself into one of æsthetics.

"A commodity may be a humble article of utility, but, if colored, its manufacturer and distributor share with the manufacturer and distributor of such commodities the speculative risks that go hand-in-hand with styles—added manufacturing equipment, increased investment in stocks, greater storage space, the uncertainty of style tenure, and so on. Increased costs result, and ultimately fall upon the consumer. In many instances the consumer is confused by the wide range of choice presented to him; he desires only utility, but he pays for an ornament. If the producers, distributors, and users are of one mind in regard to the economic advantage of conforming to a simplified list of colors, it should be possible to establish such a list by the unanimous consent of all concerned. The entire situation is summed up as follows: Over-diversification is wasteful; over-standardization stultifies and restricts. Simplification, intelligently and moderately applied, offers a middle ground between these two extremes."

From the standpoint of the manufacturer it is clearly evident that he must invest capital in extra equipment in order to maintain production of the full line of colors. In addition, his inventory is made more complicated and at the same time he must have additional storage facilities, thereby incurring still greater expense. It must be considered also that he is manufacturing to meet an uncertain demand and that he is confronted with the variable factor of style which he had never thought would intrude itself into his business. While his product may be one of practical utility, he now must share with the manufacturers of such articles as clothing the speculative risks that go hand in hand with styles. Such things are virtually all overhead costs that eventually find their way to the consumer.

In a similar manner the distributor faces the problem of increased inventory, heavier investments to meet the demands for more variety, extra space and additional rent. Of a necessity, he adds these extra costs to his charges to the dealer, and he in turn passes them on to the consumer. While the consumer in many instances is confused with the choice that is presented to him, and while he may only desire utility in an article, he must pay for the cost of color, whether it is to his liking or not.

If such a thing could be that the producers, distributors and dealers were of but one mind with respect to the economic advantage of conformity to a simple list of colors, it is highly probable that it would be possible to establish such a list by the unanimous consent of all concerned, and it would seem that with all elements in industry cooperating it should be possible to arrive at conclusions that would prove mutually satisfactory.

From the foregoing it is easily seen that there is a wide divergence of opinion on the subject of color in the home, and that unless something is done to reduce costs and establish more uniform color schemes, it would appear that it cannot continue to be but little more than a passing fad. At least this is the opinion one would gain from having talked to many manufacturers, distributors and dealers in electrical appliances.

New Goods—for Your Inspection

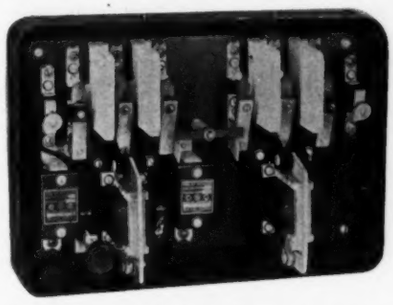
A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

Radio Grill Cloth

Tindall Fabrics Corp., Pawtucket, R.I., has brought out a radio grill cloth, dark golden brown in color, for use in radio cabinets, loud speakers, etc. The cloth is approximately 45 in. in width and six different constructions or designs are available.

Motor Control Switch

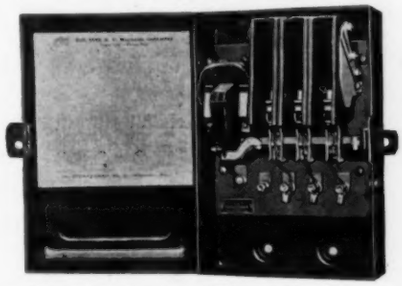
General Electric Co., Schenectady, N. Y., has brought out a motor control switch suitable for reversing small alternating-current motors, where the motor can be



thrown across the line. It consists of two triple pole, barrier type, magnetically operated contactors, mechanically and electrically interlocked, and two hand-reset temperature overload relays mounted on a molded base and enclosed in a drawn-shell inclosing case. The overload relays protect the motor from overheating because of mechanical overload or single-phase operation. These relays are a fixed part of the switch, but have interchangeable heaters. To adapt this switch for use with a motor of a different rating but the same voltage, it is merely necessary to select heaters corresponding to the motor current.

A. C. Magnetic Contactor

Cutler-Hammer Mfg. Co., 12th and St. Paul Ave., Milwaukee, has placed on the market a line of A.C. magnetic contactors for controlling lighting and power cir-



cuits automatically. Some of the features of these switches are hammer head type magnets with self aligning armatures, continuous duty magnet coil, hardened steel bushings, tin dipped solid copper contacts, magnetic blowouts and chimney type arc shields. The large size contactors have the magnet frame supported on a spring plate which absorbs the shock of the magnet on closing. Two or three wire control can be used. With two wire control, low voltage release is provided and with three wire, low voltage protection is provided. Two, three and four pole types are available in current carrying capacities ranging from 20 to 150 amperes. The contactors are supplied mounted in a split inclosing case or on a slate panel for switchboard mounting.

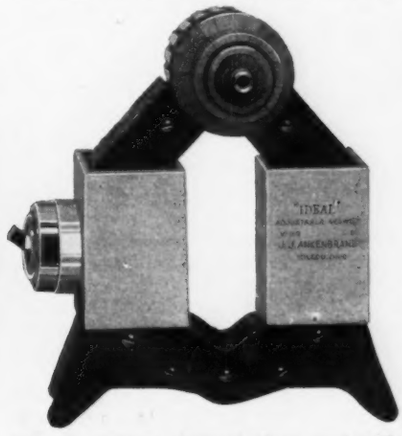
Amplion Air Column Unit

J. W. & W. L. Woolf, 277 Fulton St., New York, is marketing the Amplion Giant dynamic air column unit for loud speakers in public address and band re-

peating systems to be used in large halls and open spaces. It is designed to operate on 10 to 50 watts output.

Ankenbrandt Adjustable Growler

J. J. Ankenbrandt, 2140 Wakeman St., Toledo, is marketing the Ideal adjustable growler in various sizes for testing armatures from ¾ to 20 in. or more in diameter. The Ideal growler can be used with any standard meter or lamp test set,



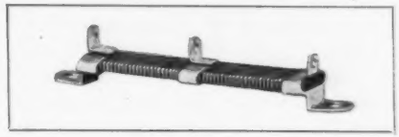
or as a magnet charger when used with batteries. It is hinged at the base and the windings are inclosed in metal case.

Gilby Ballast Wire

Gilby Wire Co., Riverside Ave., Newark, N. J., is marketing a ballast wire for use in connection with radio receiving sets to compensate for variations in line voltage and prolong the life of A.C. tubes. This wire is designed to be connected in series with the primary of the supply transformer and sufficient wire should be used to give a drop of about 70 volts across the primary and 40 volts across the ballast. It is recommended that this wire be wound in helical coils supported only at intervals or wound on a mica strip. It performs best in air as the more readily it can change temperature the better is the ballast action. No. 34 wire is the most advantageous size according to the manufacturer and about 15 ft. is required for the average radio transformer.

Center-Tapped Resistance

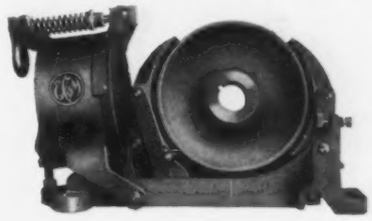
Polymet Mfg. Corp., 599 Broadway, New York City, is making a resistance strip fitted with end and center soldering



and mounting lugs in sizes from 10 to 100 ohms. They are so constructed that the center tap distance can be made to suit requirements.

Direct Current Brakes

Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, has placed on the market Type WB brake, which is designed to permit quick armature changes. Type WB brake is a D.C. shoe type brake for



cranes, hoists, steel mill machinery and similar applications. The brake is so constructed that there are no rods over the top, facilitating the replacing of motor armatures without taking the brake apart, and minimizing the chances of destroying brake adjustments. The connecting link for the brake arms is below the wheel. Molded asbestos brake shoes, ½ to ¾ in. thick, are used (except on the smallest size, Model No. 10 brake) with rivet holes molded in them.

Regulating Rheostat

Cutler-Hammer Mfg. Co., 12th & St. Paul Ave., Milwaukee, has placed on the market a D. C. regulating rheostat. It is designed for regulating the speed of fractional horsepower motors driving small blowers, fans, buffers, bookkeeping machines and similar apparatus, as a dimmer for lighting circuits or as an electric heater regulator. It is of the circular plate type completely inclosed. It is small

to permit mounting directly on machines. The standard rheostat is furnished for conduit wiring. The device consists of a cement imbedded resistance unit with brass contact buttons and a movable contact arm. The inclosing case protects the unit and prevents contact of the operator with current carrying parts.

Insulated Wire Stripper

Wire Stripper Co., 251 Erie Bldg., Cleveland, has placed on the market a motor driven wire stripping device designed to strip the insulation from the ends of almost any size and kind of wire.

An adjustable butt rod gives the desired length of strip and as the insulation is removed the wire is polished. On stranded wire the loose ends are twisted in the same operation and it is stated that production up to 2,000 ends an hour can be stripped by one operator.

Century D. C. Motors

Century Electric Co., 1806 Pine St., St. Louis, is marketing the Type DM line of direct current motors. The field of these motors is a two pole laminated steel structure. The compound field coils are wound on forms and the armature slots are insulated with alternate layers of fish paper and varnished cambric. The bear-

ings are of cast phosphor bronze and have figure-8, machine-cut, oil grooves to insure even distribution of oil on the bearing surfaces. These motors are built in standard sizes from 1/6 to ½ hp. at speeds corresponding to standard speeds of A.C. motors.

Bodine Television Motor

Bodine Electric Co., 2254 W. Ohio St., Chicago, announces three television motors Types TV-30, TV-20 and TV-12, for driving television scanning discs. These motors are designed to provide suitable speed stability and yet, with a rheostat, be variable throughout a range of 25 percent above or below normal speed. This

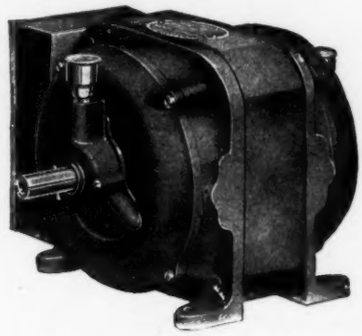
allows the scanning disc to be perfectly synchronized with the sending apparatus. These motors are designed to operate 18, 20 and 24 in. scanning discs at 1080 r.p.m. They can be operated on either alternating or direct current. This feature is made possible by a special compensating winding. Rheostats and scanning discs are not furnished by the Bodine Electric Co.

Portable Hoist Motors

General Electric Co., Schenectady, N. Y., has designed a line of portable hoist motors to meet the requirements of high starting torque and intermittent operation. Although primarily developed for use on hoists, these motors are adaptable to use on other installations having similar requirements. The motor is entirely enclosed and all parts are well protected. The D.C. motors are of the varying speed type; and the A.C. motors, both polyphase and single phase, are of the constant speed type. The polyphase motors have cast high resistance rotors.

Baldor Television Motor

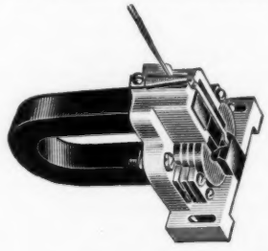
Baldor Electric Co., 4352 Duncan Ave., St. Louis, Mo., has brought out the Baldor television motor. This motor is designed to provide the required speed range, to eliminate sparking with its consequent distortion of the picture, to have small friction so that the receiver can follow the moving picture accurately and also to be quiet so that non-essential sounds are not transmitted. This motor is designed to be



varied in speed in small steps from 50 to 1100 r.p.m. in the six pole size and from 100 to 1700 r.p.m. in the four pole size. It has no brushes, commutator or automatic switch which give it a tendency toward sparking.

Amplion Cone Unit

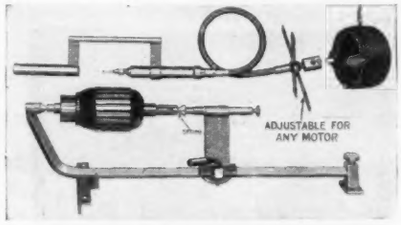
J. W. & W. L. Woolf, 277 Fulton St., New York, has placed on the market Amplion Model No. C-104 cone loud speaker unit. The laminated field structure is de-



signed to produce an intense field. The moving parts are light and an accurately balanced restoring spring is used.

Ankenbrandt Mica Undercutter

J. J. Ankenbrandt, 2140 Wakeman St., Toledo, is marketing the Ideal Mica undercutter. It is a portable outfit equipped



with a flexible shaft and a collet chuck to accommodate ⅛ in. burs and shafts ranging from ⅜ to ½ in. The device is designed for overhead suspension and can be used in connection with undercutting mica on armatures having varying widths of slots.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore. This Classified Index has been an exclusive ELECTRICAL RECORD feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Aluminum. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
AMMETERS. See Instruments.
ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.
ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.
ARMORING MACHINES. See Wire Manufacturing Machines.
ARMS, FLEXIBLE. See Tubing Flexible Metallic.
ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp. (Elec'l Dept.) New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Deceleco, Inc., Wayne, Mich.
Federal Insulating Corp., Yonkers, N. Y.
Johns-Manville Corp. (Elec'l Dept.), New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.
BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.
BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.

1

Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Pittsburgh Valve & Fittings Co., Barberton, Ohio. (Cast Iron.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.
BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Bantam Ball Bearing Co., South Bend, Ind.
Braun Bearings Co., Primos, Pa.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton,
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Stroh Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Arguto Oilless Bearings Co., Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Mechanical Devices Co., Aurora, Ill.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. P. B. See Mechanical Devices Co.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
P. O. B. See Mechanical Devices Co.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.
BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.
BENDING. See Punching & Bending.
BINDING POSTS. See Posts, Binding.

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BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.
BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago,

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago.
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 309 Decatur, Sandusky, Ohio.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.
BRAIDING MACHINES. See Wire Manufacturing Machines.
BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.), Baltimore, Md.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Dallas Brass & Copper Co., 812 Orleans, Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo.						H	
B. B. B. See Becker Bros. Elec'l Corp.							
Baylis Co., Bloomfield, N. J.						H	
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill.			C	W	S	H	L
Blanck & Carrier Corp., 115 W. 83rd, New York, N. Y.			C				
Boston Woven Wire Brush Co., Northboro, Mass.				W			
Boxill-Bruel Carbon Co., Columbus Park, O.			C			H	
Burrows & Co., 1135 W. Van Buren, Chicago, Ill.			C				
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.			C				
Carbon Engrg. Co., Slinger, Wis.			C				L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O.			C				
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y.			C				
Carenco. See Carbon Engineering Co.							
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y.			C	W	S		L
Columbia Machine Wks. & M. L. Co., 283 Chestnut, Brooklyn, N. Y.						H	
Cooley Mfg. Co., 98 Park Place, New York				W			
Diamond C. See Chapin Co., Chas. E.							
Dixon Crucible Co., Joseph, Jersey City							
Electra. See Automotive Mfg. Co.							
Electric Accessories Co., 310 York Ave., Philadelphia, Pa.						H	
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa.							
Eureka Copper Products Corp., North East, Pa.				W	S	H	
Fleck Carbon Co., 508 Broome, New York			C				
General Electric Co., Schenectady, N. Y.			C			H	L
Graphalloy. See Graphite Metallizing Corp.							

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BRUSHES, Commutator—Continued
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C . . . . H . .
Henrite Products Co., 98 Park Place, New York, N. Y. ..... C . . . . . .
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio .... H . .
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C . . . . . .
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C . . . . . .
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C . . . . . .
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y. C . . . . . .
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C . . . . . .
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C . . . . . .
National Carbon Co., Cleveland, O. ..... C . . . . . .
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. .... . W . . . . .
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C . . . . . .
Pure Carbon Co., Wellsville, N. Y. ..... C W S . . L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. .... W L
Salem Electrical Supply Co., Salem, Mass. .. W . . . . .
Seabury, Ralph L., Factories Bldg., Toledo, O. C . . . . . .
Sharr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C . . . . . .
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C . . . . . .
Stackpole Carbon Co., St. Mary's, Pa. .... C . . . . . .
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C . . . . . .
U. S. Graphite Co., Saginaw, Mich. ..... C . . . . . .
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill. ..... C . . . . . .
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L
BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.
BUNCHING MACHINES. See Wire Manufacturing Machines.
BUSHINGS, SHAFT. See Bearings and Bushings.
CABINET GRILL CLOTH. See Cloth, Untreated.
CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.
CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Doxier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 165 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dall Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeels, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Reinh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 959 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Staten Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schroyer Ave. Canton, O.
Tanner & Co., Wm. P., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
Wadeworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

Die Castings

Aluminum, Tin, Lead and White Brass, Special Machines, Dies, Tools, Jigs and Stampings

Advance Tool & Die Casting Co.
1654-60 Holton St., Milwaukee, Wis.
Edgewood 284

CABINETS AND BOXES, Wood

Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Delker Co., Geo., Henderson, Ky.
Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
King Mfg. Corp., Bano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
National Cabinet Co., New Philadelphia, O.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Ottawa Furniture Co., Holland, Mich.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessler Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo.
West Box Co., 235 Liberty, Springfield, Mass.
CABLE ARMORING MACHINES. See Wire Manufacturing Machines.
CABLE TEST SETS. See Instruments, Portable and Switchboard.
CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington, Del.
Cleveland Container Co., 10800 Beres Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.
CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
CARBONS, Battery, See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
CARTONS. See Boxes and Wrappers.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.
CASTINGS, Aluminum. See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.

McGill Metal Co., Valparaiso, Ind.
Ohio Pattern Wks. & Fty. Co., 2730 Spring Grove Ave., Cincinnati, O.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Twin City Die Castings Co., Talmadge and 33rd Ave., Minneapolis, Minn. (White Metal).
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 3640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 356 Fourth Ave., New York, N. Y.
Illinois Die Casting Co., 551 W. Congress, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., S. 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

American High Speed Chain Co., 221 E. South, Indianapolis.
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Head Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Servwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.

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Circuit Breakers—Continued
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
Industo-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.

CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros. Co., Plano, Ill.

CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.
CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.
CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH UNTREATED

Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Boyle & Co., John, 112 Duane, New York, N. Y.
Tindall Fabrics Corp., Pawtucket, R. I. (Grill Cloth).
Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill. (Cotton Duck)

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) .... See B
Silk ..... See S

Acme Wire Co., New Haven, Conn..... C S P .. ..
Armatite. See Mica Insulator Co.
Brand & Co., Wm., 268 Fourth Ave., New York ..... P .. ..
Campbellite. See Campbell Fibre Co.
Campbell Fibre Co., Stanton, Delaware..... B
Carboloid Products Corp., 15 Park Row, New York, N. Y..... C .. P .. ..
Case Brothers, Inc., Highland Park, Conn.. .. .. .. B
Case Mfg. Co., Unionville, Conn..... P .. ..
Case & Risley Press Paper Co., Oneco, Conn. .. ..
C-F. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa..... P F B
Chicago Mica Co., Valparaiso, Ind..... C .. ..
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Diamond State Fibre Co., Bridgeport, Pa.. .. .. P .. ..
Dielectric Mfg. Co., St. Louis, Mo..... C S P .. B
Federal Insulating Corp., Yonkers, N. Y... C .. P F ..
Fyberoid. See Wilmington Fibre Specialty Co.
General Electric Co., Schenectady, N. Y.... C .. P .. ..
Hewitt & Bros., C. B., 16 Perry, New York C .. P .. ..
Hi-Tex. See Stevens Paper Mills.
Incella. See Tarentum Paper Mills Co.
Irvington Varnish & Insulator Co., Irvington, N. J. ..... C S P .. ..
Manning Paper Co., J. A., Troy, N. Y. .. .. B
Mica Insulating Co., 200 Varick, New York C S P .. B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. ..... P .. ..
National Vulcanized Fibre Co., Wilmington, Del. ..... F ..
New Jersey Wood Finishing Co., Woodbridge, N. J. ..... C .. ..
Ohmoid. See Wilmington Fibre Specialty Co.
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass. .. .. .. F ..
Rogers Paper Mfg. Co., South Manchester, Conn. ..... B
Schweitzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Seutan Co., 342 Madison Ave., New York .. .. P .. ..
Sico. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y.. .. .. .. F ..
Standard Insulation Co., Rutherford, N. J. C S P .. ..
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varised Hard Fibreboard)..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn..... B
Tarentum Paper Mills Co., Tarentum, Pa.. .. .. P .. ..
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. .. .. P .. ..
West Virginia Pulp & Paper Co., 200 5th Ave., New York..... B
Wilmington Fibre Specialty Co., Wilmington, Del. ..... P .. ..

CLUTCHES, Magnetic

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished

Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., 22 Elkins (South Boston), Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero Products, Inc., 1773 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York, A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Colilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 27th & Sanderson Sts., Camden,
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 226 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Sevison Magneto Engrg. Co., 397 Phillips, Toledo, O.
Stunz & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co., 2242 Smead Ave., Toledo, O.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR

Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator. .
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS

Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator

Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riopelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.

CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor

Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 293 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Illauson Ave., Los Angeles.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.

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Electrical windings to specification.

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Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 319 W. Ohio, Chicago, Ill.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Products Corp., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS

Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Raumbach Mfg. Co., 1810 S. Kilbourn Ave., Chicago, Ill.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

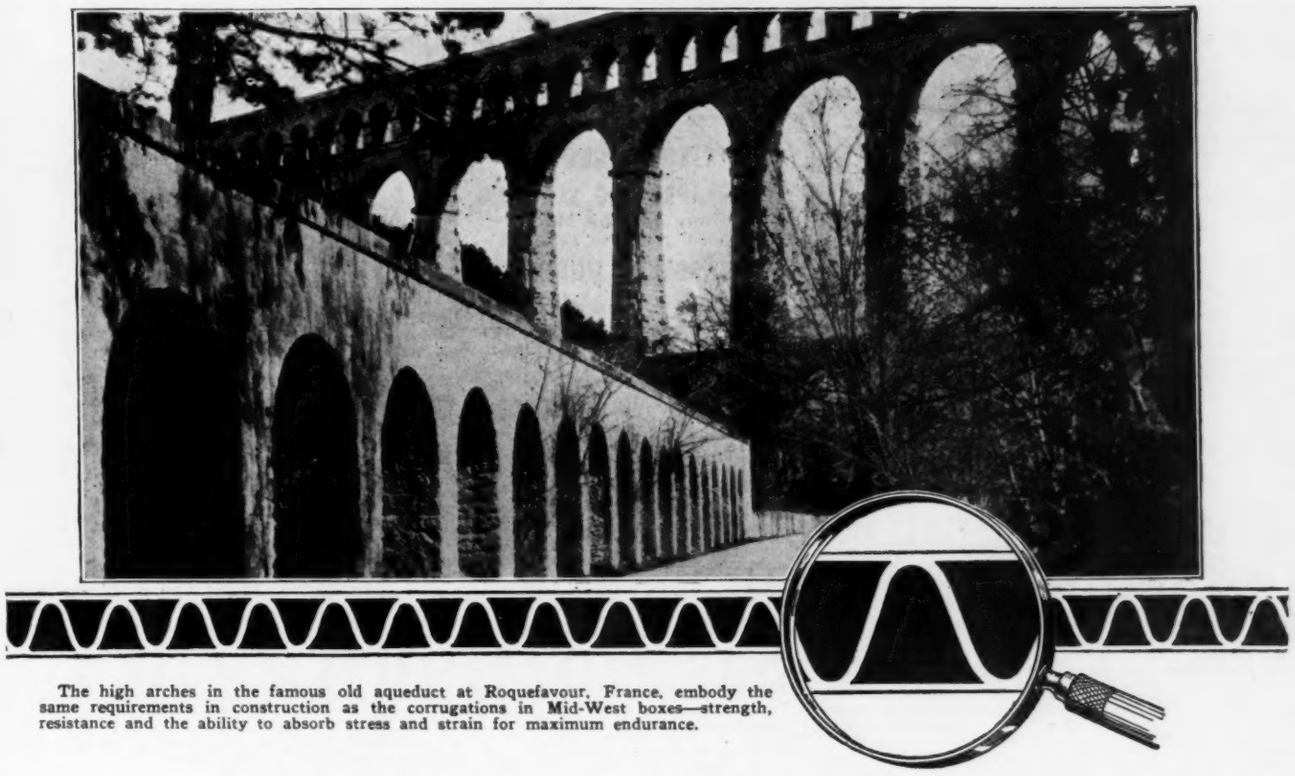
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.



The high arches in the famous old aqueduct at Roquefavour, France, embody the same requirements in construction as the corrugations in Mid-West boxes—strength, resistance and the ability to absorb stress and strain for maximum endurance.

A Question—and an Answer

We have been asked—"What are the reasons for the consistent strength of Mid-West corrugated boxes?" The reasons are no secret from the many who have standardized on the Mid-West product.

First—The fine, serious minded, expert organization whose chief ideal is to make a better shipping box than has ever been made before.

Second—The extreme high quality of the box itself due to a high, uniform grade of materials, careful manufacture and stringent inspection.

Third—The great strength and resistance of each individual high corrugated arch, backed by the highest test liners required by railroads.

Fourth—The famous Mid-West Triple Tape Corner reinforcing the point of greatest strain.

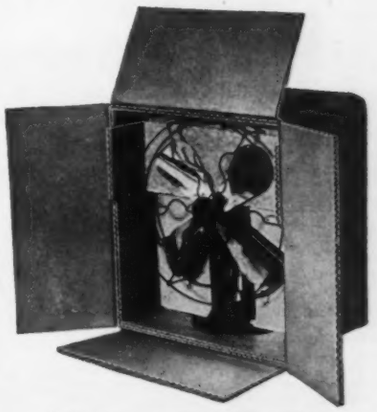
Fifth—Unusual strength on the score lines where most boxes are weak.

These are major reasons, creative of such a heavy demand for this better Mid-West box that between 1914 and 1926 five box factories and two mills had to be built or acquired to take care of shippers' requirements. Today the corrugated boxes produced by the Container Corporation, with its fifteen plants, have also been standardized on a par with Mid-West construction, acknowledged the best.

The list of users of our corrugated boxes is practically a registry of American "Big Business"—and the list is steadily growing. Savings by their use have been shown to be 30% to 70% and a reduction of shipping troubles has been a result.

These reasons briefly answer the question. A trial by you, Mr. Shipper, will verify each one. Don't buy inferior quality at a price. You only pay more in the long run. Try our corrugated boxes.

And if you need solid fibre boxes—the Container Corporation will supply you with a quality which has not as yet been surpassed. Fill in coupon and mail today.



High, strong resilient corrugations form a powerful wall of resistance and defence against transportation abuses.

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111 W. Washington St. CHICAGO, ILLINOIS

Six Mills—Nine Factories Capacity 1200 tons per day

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Gentlemen: Please have one of your experts check our present packing and shipping methods—without obligating us—for the purpose of reducing our costs if possible.

Name .....

Title .....

Firm .....

Address .....

ENGRAVING, Radio Panel—Continued
Kich-O-Gravure. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co. Inc., H. P., Newark, N. J.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati,
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel

EYELETS
Platt Bros. & Co., Waterbury, Conn.

FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT
Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

FERRULES
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., Dept. 6, 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanised. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Duresto. See Spaulding Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4614 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Agasote Millboard Co. (Fernwood), Trenton, N. J.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibro Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark.
Suter & Nuetzl, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1264 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H

FIBRE—*cut to any form*
Sheet, Rod, Tubing
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VARNISHED CLOTH
COTTON TAPES AND SLEEVING
Everything for the Motor
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THE CONSUMERS RUBBER CO
CLEVELAND 1302-4-6 ONTARIO ST
CHICAGO 320 WRIGLEY BLDG

American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B
American Pin Co., Waterbury, Conn. I
American Ring Co., Waterbury, Conn. (Candle.) ..... S
Ampinco. See American Pin Co.
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn. ..... S
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. ..... B
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York. ..... B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. ..... B
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I H
Cambridge Brass Co., Cambridge, Mass. ..... B
Cleanexy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B S
Crescent Brass Mfg. Co., Reading, Pa. ..... B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ..... B I
Dunlap Co., John, Carnegie, Pa. ..... S
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. ..... B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. I
Fralick Co., S. R., 15 S. Clinton, Chicago. I
Franklin Brass Foundry Co., Reading, Pa. ..... B
Friedley-Voshardt Co., Chicago. ..... B
Full-O-Lite Co., 50 Dey, New York, N. Y. ..... B
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland. I
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... S
Incandescent Supply Co., 468 West Broadway, New York, N. ..... B H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 228 Jelliff Ave., Newark, N. J. (Cross Bar.) I
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y. I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I
Liberty Machine Co., Wauwatosa, Wis. ..... B I
L. & K. Mfg. Co., 440 Adelphi, Brooklyn, N. Y. ..... H
L. & W. Brass Wks., 820 Orleans, Chicago, Ill. ..... B
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. I
Macallen Co., Foundry St., Boston, Mass. I
Metal Products Co., 210 Canal, New York. ..... B
Metro Iron Ornament Co., 191 Christie, New York, N. Y. I
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. I
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. ..... B
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. ..... S
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. ..... B
Noblit. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. I
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. ..... B S
Peerless Products Line, 5612 First Ave., Baltimore, Md. ..... B H
Perfeclite Co., 1457 E. 40th, Cleveland. ..... S
Pittsburgh Valve & Fittings Co., Barberton, O. I
Plume & Atwood Mfg. Co., Waterbury, Conn. ..... B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. ..... B I
Rodale Mfg. Co., 200 Hudson, New York. ..... B H
Sandow Tool Co., 1440 Bway, New York, N. Y. ..... S
Scovill Mfg. Co., Waterbury, Conn. ..... B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors) ..... B
Springfast. See Plume & Atwood Mfg. Co.

The Simplex Refillable
FUSE PLUG
The plug that can be refilled with standard fuse wire.
F. W. POWELL
119 W. Ohio St., Pittsburgh, Pa.

Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. ..... B
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. I
Steele & Johnson Mfg. Co., Waterbury, Conn. ..... B S
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. I
Triumph Mfg. Co., 310-13, West New York, N. J. ..... S
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L. & K. Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B
Vester, Sons, Alfred, 5 Mason, Providence, R. I. ..... B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B
Walden Tool & Metal Mfg. Co., New Haven Conn. .....
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. ..... B
Waterbury Mfg. Co., Waterbury, Conn. ..... B S
Waterbury Metal Wares Co., Waterbury, Conn. ..... S
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. ..... B S
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. ..... B
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 280 Guttenberg, San Francisco, Cal.
Cramblet Engineering Corp., 280 Guttenberg, Milwaukee,
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jewel Elec. & Mfg. Co., 4505 Ravenswood Ave., Chicago, Ill.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.

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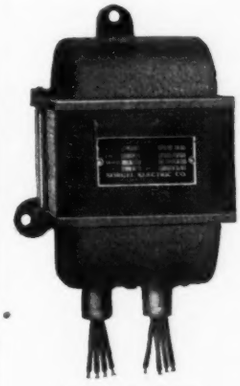

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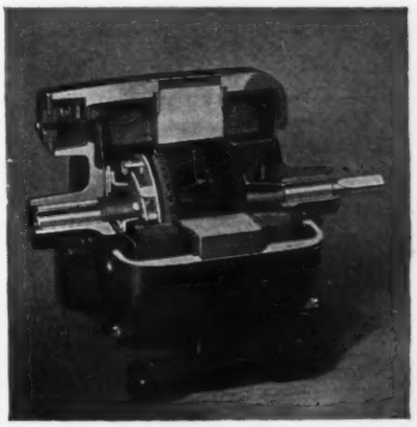

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FUSE TESTERS. See Testers, Fuse and Circuit.

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Cartridge ..... See C
Plug ..... See P
Non-Refillable ..... See N
Refillable ..... See R
Open Link ..... See O
Fuse Wire ..... See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. .. P . . . . .
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn. .. P N . . .
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. .. P . . . . .
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass. C P N R O
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th St., Chicago, Ill. ..... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C . . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va.. C P N R . .
Elliott Electric Co., Shreveport, La. ....
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y. ..... C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... C . . . . R . .
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. .. P . . R . .
Hudson Wire Co., Ossining, N. Y. .... O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. ..... C P N . . O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. ..... C . . . . . .
Monarch Fuse Co., Jamestown, N. Y. ..... C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. ..... C P . . R . .
Platt Bros. & Co., Waterbury, Conn. .... O
Powell, F. W., 119 W. Ohio, Pittsburgh.. . . P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass.. C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C . . . R . .
Royal Elec. Co., Chelsea Station, Boston.. . . P N . . .
Six-In-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R . .
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GAS INERT

Helium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Celoron Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co., Bridgeport, Pa.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago,
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators.

GLASS BULBS. See Bulbs, Glass.

GLASS CANDLES. See Candles, Fixture.

GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Beryllite. See Plaut & Co., L.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cromax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delics-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletieco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kauffeld Glass & Ceramic Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Mellite. See Gillinder & Sons, Inc.
Miero. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearltone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestopal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.

GRAPHITE BEARINGS. See Bearings, Oil-less.

GRID LEAKS. See Radio Circuit Components.

GRIDS, Resistance. See Units, Rods and Grids.

GRILL CLOTH. See Cloth, Untreated.

GROMMETS. See Eyelets.

GROUND LOCATORS. See Instruments, Portable and Switchboard: also Testers, Coil.

GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.

HOT WIRE METERS. See Instruments, Portable and Switchboard.

ICE CREAM CABINETS. See Refrigerator Cabinets.

IMPREGNATING COMPOUNDS. See Wax and Compounds.

IMPREGNATING, VACUUM. See Ovens, Industrial.

INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.

INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.

INSTRUMENT, Jewels. See Jewels.

INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.

INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
Jaynes, R. P., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.

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Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Rodefer Glass Co., Bellaire, O.
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing
Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

JOINTS, Fixture Insulating
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.
LACQUER, ARMATURE. See Paint, Varnish and Lacquer.
Metal. See Paint, Varnish and Lacquer.
LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES
(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.
LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa. (Flashlight.)

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Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs Inc., 2736 Wentworth Ave., Chicago, Ill.
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.
LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

LOUD SPEAKERS
Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Air-Chrome. See Temple, Inc.
Associated Radio Corp., Ann Arbor, Mich.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Borkman Radio Corp., 152 E. Seventh, S. Salt Lake City, Utah.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 12nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Lata Inlsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products. 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radioceive. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Purepower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Raliotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swcboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
United Radio Corp., 25 Leighton Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Vitalitone Radio Corp., 88 University Place, New York,

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Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper
Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY
Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

MACHINE SCREWS. See Screws, Machine.
MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES
Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making
For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent
Bullens Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chica.
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.

MANGANESE, Battery. See Chemicals, Battery.
MEASURING INSTRUMENTS. See Instruments.
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments, Laboratory Standard.
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
METAL CUTTING OUTFITS. See Welding and Cutting Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines.
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA
Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion., S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.

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PUNCTURE TEST .025" PLATE

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
27,416 Volts	22,171 Volts	23,212 Volts
Volts per mil of thickness computed from average breakdown voltage.		
1,097 Volts	1,109 Volts	1,161 Volts

No surface leakage during puncture tests was noted.

FLASH-OVER TEST (DRY)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,690 Volts	19,120 Volts	18,610 Volts

FLASH-OVER TEST (After Standing in Humid Air 24 Hours)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,970 Volts	18,440 Volts	18,460 Volts

SECOND READING (Electrodes in Same Position as in First Reading)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,770 Volts	18,560 Volts	18,290 Volts

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Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Munsell & Co., Eugene, 204 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K, 804 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED
Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION

Alco. See American Insulator Corp.
Alden Mfg. Co., Brockton, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., 420 Lexington Ave., New York.
Amerine. See American Insulator Corp.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Braylite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimco. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4614 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 76 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hercules Powder Co., Wilmington, Delaware.
Herculite. See Colosta Co.
Huetter-Premier Machine Co., 7215 Livernois Ave., Detroit, Mich.
Hi-Heet. See Insulation Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 404 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Bellville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.

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Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamite. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Co., Enterprise Ave., Trenton, N. J.
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Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Resinite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 304 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.
Starlite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
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Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.

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MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches, Snap (Heavy Duty).

MOTORS

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Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Ace. See A. C. Dayton Co.
A. C. Dayton Co., 308 E. 1st, Dayton, O..... F S ..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland M .. .. ..
Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
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American Elec. Motor Co., Cedarburg, Wis..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
A. R. E. See Westinghouse Elec.
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F .. ..
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 812 Lafayette, Toledo, O..... F .. .. ..
Cah. See Westinghouse Elec. Mfg. Co.
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord, N. H..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O..... F S ..

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Dumore. See Wisconsin Elec. Co.
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....
Electric Specialty Co., 231 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., Chicago, Ill..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. ..... F .. S ..
General Elec. Co., Schenectady, N. Y..... M F S U
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hobart Bros. Co., Troy, O..... M .. S ..
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Jantz & Leist Elec. Co., Cincinnati, O..... M F .. ..
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King Elec. Co., 35 Murray, New York..... M .. .. ..
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L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O..... M .. .. ..
Mando Co., Syracuse, N. Y..... .. F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich..... M .. .. ..
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MC. See General Electric Co.
Metergram. See Bodine Elec. Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
Northwestern Elec. Co., 408 S. Hoyne Ave., Chicago, Ill. ..... M .. S ..
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Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Pan. See Chandeysson Elec. Co.
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Ra-Lite. See Acme Elec. & Mfg. Co.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2650 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O..... M F S U
Rochester Elec Products Corp., Rochester, N. Y. M .. S ..
Rotator. See Bodine Elec. Co.
Roth Bros. & Co., Chicago, Ill..... M .. S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
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Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
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Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Usemco. See U. S. Elec Mfg. Co.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. ..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O..... M .. S ..
Wisconsin Elec. Co., 59 16th, Racine, Wis.... .. .. .. U
Woods Mach. Co., S. A., Boston..... M F S ..
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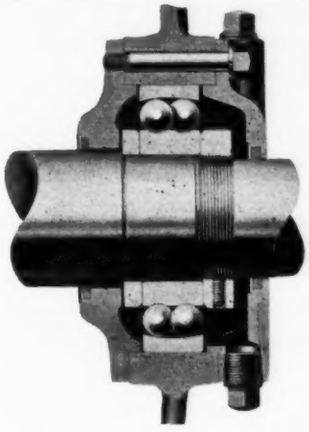

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Etched Products Corp., 99 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
General Etching & Mfg. Co., 3070 W. Grand Ave., Chicago Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Meyer & Wenthe, 30 S. Jefferson, Chicago, Ill.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Waterbury Button Co., Waterbury, Conn.

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International Nickel Co., 67 Wall, New York, N. Y.
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OIL-LESS BEARINGS. See Bearings, Oil-less.

OSCILLOSCOPES. See Instruments, Laboratory Standard.

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Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
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Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
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Freas. See Thermo Elec. Instrument Co.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
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Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
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Kenwortiny, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Milo Co., 717 Sycamore, Cincinnati, O.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., Chicago, Ill.
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Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., E. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5834 Tabor Rd., Philadelphia, Pa.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thermo Elec. Instrument Co., 1206 Grove, Irvington, N. J.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6500 Mack, Detroit, Mich.

OXIDES, Battery. See Chemicals, Battery.

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Federal Metallic Packing Co., Wakefield, Mass.
Packtite. See Federal Metallic Packing Co.

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KEY
Varnishes, Insulating .....See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing .....See L

Acme White Lead & Color Wks., 8250 St. Aubin Ave., Detroit, Mich. L
Acme Wire Co., New Haven, Conn V
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Lastite Co., 3166 Lincoln Ave., Chicago.. .. P L
Antakwa Co., 1329 Mohawk, Chicago, Ill..... .. P ..
Apexior. See Dampney Co. of America
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-O-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Colt, Irvington, N. J..... .. L
Atom Chemical Co., 96 E. 10th, New York, N. Y. L
Bakelite Corp., 247 Park Ave., New York, N. Y. L
Belden Mfg. Co., 2310B, S. Western Ave., Chicago
Benolite Co., 501 Columbia Bank Bldg., Pittsburgh. V P ..
Berry Bros., Leib & Wight, Detroit, Mich..... V ...
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V ...
Bradley-Hurtz Co., 2626 S. Dearborn, Chicago, Ill. L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P ..

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Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P ..
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V ....
Comulac. See Martindale Elec. Co.
Dampney Co. of America, Boston, Mass..... V ....
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P ..
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. .. P ..
Eastman Kodak Co., Rochester, N. Y..... .. L
Eclipse Paint & Mfg. Co., Cleveland, O..... .. P ..
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York.. L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... L
Federal Insulating Corp., Yonkers, N. Y..... V P ..
Flex-ib-lac. See Dielectric Mfg. Co.
Franche & Co., 440 Orleans, Chicago, Ill..... L
General Elec. Co., Mds. Dept. Bridgeport, Conn.. V P ..
General Plastics, Inc., 76 Walck Rd., N. Tonawanda, N. Y. ..... V ....
George Co., P. D., St. Louis, Mo..... V ....
G. E. See General Elec. Co.
Glidden Co., Cleveland, O..... V P L
H. B. See Maas & Waldstein Co.
Hercules Powder Co., Wilmington, Del..... V ....
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P ..
Insulaterite. See Olmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. & Co., 450 E. 3rd, Dayton, O..... V P ..
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P ..
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P ..
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. ..... V ....
Mawalac. See Maas & Waldstein.
Meeco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V .... .
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. L
O'Brien Varnish Co., South Bend, Ind..... V P L
Olmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. .... P ..
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Republic Varnish Co., 200 Thomas, Newark, N. J. V .... .
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P ..
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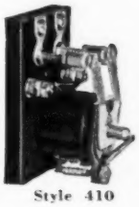

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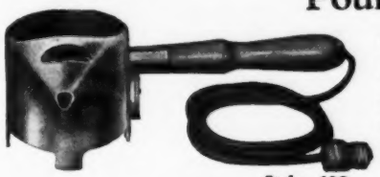

Style 608

Capacities from one pint to two quarts. Temperature range 180 to 850° F. Voltages 110 to 220, power 60 to 660 watts.

Also electric pots from ½ pint to 40 quarts

J. STRUTHERS DUNN
1135 Race St., Philadelphia, Pa.

The newer, safer, more efficient way —*use* SHERMAN SOLDERING LUGS

Round end, side formed lug

Approved by the Underwriters (*Look for the marking*)

The old style "hit or miss" Soldering Lug lines were so incomplete that many users made their own lugs. To-day SHERMAN Soldering Lugs are stocked by jobbers in a standard, complete line; with dimensions and designs carefully worked out to pass the Underwriters' severe requirements.

45° Angle Lug

Centre Formed Lug

A complete line, made only of seamless copper of exactly correct gauge

SHERMAN Soldering Lugs in sizes 15/16" O. D. and up are made of copper tubing; all sizes are absolutely seamless. Solder cannot leak through and better conductivity is assured. Round end lugs furnished unless square end are specified. Special lugs will be furnished to specification, but only those conforming to the Underwriters' standards can be stamped as approved fittings.

Ask your jobber about SHERMAN Soldering Lugs, or send to us for bulletin and samples.

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Battle Creek, Mich.

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L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave., Chicago, Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Pan. See Chandeysson Elec. Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
Roth Bros. & Co., Chicago, Ill.
Westinghouse Elec. Mfg. Co., East Pittsburgh, Pa.

PLATING AND FINISHING

Chromium Plating, Rust Proofing and other special metal-finishing processes.
Amalog. See American Machine & Foundry Co.
Plating and Finishing—Continued
American Machine & Foundry Co., 511 Fifth Ave., New York, N. Y.
Atlantic Chemical Co., Colt, Irvington, N. J.
Duro Chrome. See General Chromium Corp.
General Chromium Corp., 3220 Bellevue Ave., Detroit, Mich. (Chromium Plate.)
Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich.
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)

PLATINUM,

Sheet, Rod, Tubing, Wire.
Baker & Co., Inc., 54 Austin, Newark, N. J.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Herpers Bros., 18 Crawford, Newark, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J.
R. & H. Platinum Works, 709 Sixth Ave., New York.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment

A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Annealite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Elec. Co., Hartford, Conn.
Arro-Grip. See Arrow Elec. Co.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Belden Mfg. Co., 2310 B. S. Western Ave., Chicago, Ill. (Special Soft Rubber Plug Furnished with Belden Cords).
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products.
Circle F Mfg. Co., Trenton, N. J.
Colts Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn.
Consolidated Gas Iron Co., 32 Union Square, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., Dept. ER4, 50 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
Felso Products Co., 124 S. Calvert, Baltimore, Md.
Fitzall. See Rodale Mfg. Co.
Gaynor Elec. Co., Inc., Stratford Ave., Bridgeport, Conn.
General Elec. Co., Bridgeport, Conn.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Imperial. See Consolidated Gas Iron Co.
Iona Co., Los Angeles, Cal.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Liffy. See Esler Elec. Mfg. Co.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 252 Lafayette, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
U. S. Electric Co., 311 Chambers, Trenton, N. J.

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Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact

Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory & Co.), Portchester, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Independent Contact Point Co., 545 39th, Union City, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Nieboff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN

Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Coren, Resistance Coil.

PORCELAIN, Special Shapes

Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Parker, J. H., 296 Broadway, New York, N. Y.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co., Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS

Unglazed earthenware cups for primary (wet) batteries.
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding

Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.

PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 329 W. Water, Syracuse.
Elmes Engrg. Works, Chas. F., 322 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B., York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding

Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching

Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y.
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y.
Dunning & Boschert Press Co., 329 W. Water, Syracuse.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition

General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Mechanical Devices Co., Aurora, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Elsler Engineering Co., 770 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1826 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., 22 Elkins (S. B.), Boston, Mass.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago
All-Henry Coil Co., South Gale, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Amsco Products, Inc., 416 Broome, New York. (TRF Kit)
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Autoformer. See Thordarson Elec. Mfg. Co.
Balcon. See Pacent Electric Co.
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st, New York, N. Y.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.

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Mercer Porcelain Co., Inc., Trenton, N. J.

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Sizes—⅛ to 3 H.P.

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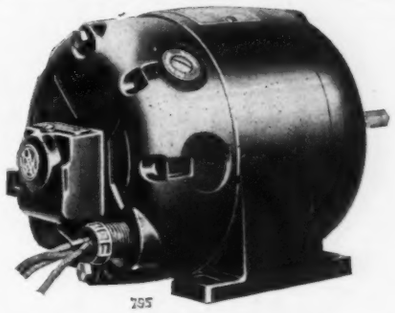

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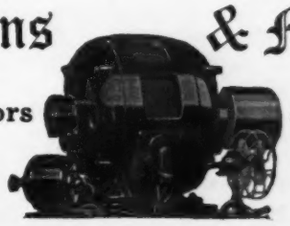

Radio Circuit Components—Continued
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Paynter Ave., Long Island City, N. Y.
Buffer. See Aerovox Wireless Corp.
Buffalo. See Amsco Products, Inc.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co. 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc. (Div. of P. R. Mallory & Co.), Portchester, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsior Radio Corp. 216 Wallabout, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See Amsco Products, Inc.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 186 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Haildorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Q Kit. See Hammarlund.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
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International Resistance Co. 2¼ S. 20th, Philadelphia, Pa.
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Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kilograd. See Pilot Elec. Mfg. Co.
Kroblack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireles Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Corp.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lauts Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loiess. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
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Microcondenser. See Sterling Mfg. Co.
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Midline. See Hammarlund Mfg. Co.
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Saturn Mfg. & Sales Co., 48 Beekman, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

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Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
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Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Bruno Radio Corp., 40 Payntar Ave., Long Island City.
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Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
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D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
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Duostat. See Amsco Products Co.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
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Klosner Radio Corp., 1023 E. 178th, New York, N. Y.
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Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
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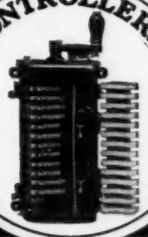

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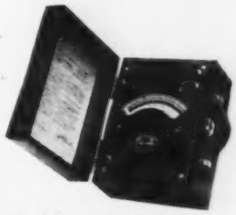

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REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

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Battery Charging	See B
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Car Trailer Connection	See C
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Arrow Elec. Co., Hartford, Conn.... F B W
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Loeffelholz & Co., Milwaukee, Wis. C
NePage McKenny Co., Armour Bldg., Seattle, Wash. F
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Yale. See Electric Products Co.

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REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel
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Dunlap Co., John, Carnegie, Pa.
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Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
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Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite. See Raleo Mfg. Co.
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Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
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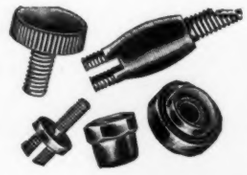
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago Ill.
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS
Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
Allen Fiter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Automatic. See Illinois Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Boyer Refrigerator Co., 2217 Locust, St. Louis, Mo.
Cameo Refrigerator Corp., 973 N. Main, Los Angeles, Cal.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dillingham Mfg. Co., Sheboygan, Wis.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gruendler Mfg. Co., Gustav J., 814 N. Broadway, St. Louis.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Co., Euclid Ave. at 65th, Cleveland, O.
Hill & Co., C. Y., 360 Pennington Ave., Trenton, N. J.
Holderie Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Iceless Cooler Corp., 225 N. Michigan Ave., Chicago, Ill. (Ice Cream Cabinets.)
Illinois Refrigerator Co., Morrison, Ill.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Ligonier Refrigerator Co., Ligonier, Ind.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Co., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal
Northey Mfg. Co., Waterloo, Iowa.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Ranney Refrigerator Co., Greenville, Mich.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal



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White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS
Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

RELAYS
(See also Circuit Breakers and Thermostats.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Duneo. See Dunn, J. Struthers.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil
Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ward-Leonard Electric Co., Mount Vernon, N. Y.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS.
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

F B D P M L
Allen-Bradley Co., 493 Clinton, Milwaukee L
Biddle, James G., 1211 Arch, Philadelphia L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O. L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) B
Bradleystat. See Allen-Bradley Co.
Controlite. See Ward Leonard Elec. Co.
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill. P
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. P B D L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. F
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. F
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. B
General Electric Co., Schenectady, N. Y. F L
Hanson-Van Winkle-Munning Co., Matawan, N. J. P
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. D
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. D M
Knoeller Elec. Co., De Pere, Wis. F
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago F B D M L
Robertson, Leo F., 536 W. 22nd, New York, N. Y. M
Schaefer Bros. Co., 1059 W. 11th, Chicago B
Simplicity. See Cutler-Hammer Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis. F
Universal. See Ward Leonard Elec. Co.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo. B
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., Mt. Vernon, N. Y. F D M
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F M

RINGS Seal. See Packing.

RIVETS
Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS. Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard
Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.

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Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave. New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS
Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.

RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge
Toycraft Rubber Co., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW MACHINE PRODUCTS
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Cetoron Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis,
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corn., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive
Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston,
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)
American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery
Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES
Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric
Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 630 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 22 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.

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Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kelton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1208 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES
Leaded. Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic
Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica
Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarnilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)

Waterbury Mfg. Co., Waterbury, Conn.

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA
Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire
Baker & Co., Inc., 54 Austin, Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE
For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Munson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator
(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE
For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain and Attachments
Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insr.

SOCKET REDUCERS
Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp
Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J.
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill.

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Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Co., Hartford, Conn. ..... M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. ..... K .. P ...
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C .... P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. .... M .. K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M .. K T .. B A
Crouse-Hinds Co., Syracuse, N. Y. ... A W .....
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T .. B A
Durez. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B ..
Fur-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C ..... B ..
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Bridgeport, Conn. ... M C K T P B A
Glow Elec. Co., 22 Queens, Long Island City, N. Y. ..... M ..... B ..
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... M C K T P B A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levoller. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Meteor Elec. Corp., 499 E. 70th, New York, N. Y. ..... K .. P ....
Molded Socket Corp., Railroad, Pa. ..... K .....
Multi Elec'l Mfg. Co., 210 N. Ogden Ave., Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant Elec.
Neark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. ..... M ..... P B ..
Roberts Elec. Mfg. Co., 311 Centre, New York, N. Y. (Candle.) ..... T .. B ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y. .....
Royal. See Sears, Henry D.
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
TEC. See Electric Company.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P .. B .. W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Waleo. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5586 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B ..
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P ....
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING
Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Ameo. See American Solder & Flux Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brunner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Leteilier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammonica.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Redena. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 330 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salwirick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tisit. See Leteilier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betzy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio. See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator

(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SOLENOIDS. See Coils

SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.

SPAGHETTI. See Tubing, Varnished Fabric.

SPEED CHANGING UNITS. See Gears (Speed Changing Units).

SPEED INDICATORS. See Tachometers.

SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS

Airway. See Binks Spray Equip. Co.
Babco. See Simons Paint Spray Brush Co.
Binks Spray Equipment Co., 3120 Carroll Ave., Chicago, Ill.
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Pneumatic Spray Co., 87 130th, Richmond Hill, N.Y.
Ideal Air Brush Mfg. Co., 203 Lafayette, New York, N. Y.
Little Brown Jug, Inc., Reading, Pa.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1911 Diversey Parkway, Chicago, Ill.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 1017 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Sprayit. See Electric Sprayit Co.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

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Cary Spring Works, Inc., 240 W. 39th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Farrington & Co., 28 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1666 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

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American Stamping Co., 978 E. 64th, Cleveland, O.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Fartex Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.

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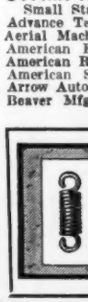
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Eureka Tool & Machine Co., Newark, N. J.
Farles Mfg. Co., Decatur, Ill.
Gauder, Paeschke & Frey, St. Paul & 15th, Milwaukee, Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
Krischer's Mfg Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Corp., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Mansfield Sheet & Tin Plate Co., Mansfield, Ohio.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Uniloy. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

Acme Steel Co., 2840 Archer Ave., Chicago, Ill.
Republic Iron & Steel Co., 335 Market, Youngstown, O.

STRIPPERS, Wire

Acme. See A. Laubscher.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Service Sales & Mfg. Co., 3429 W. 126th, Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dall Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.

Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY
Feed Through ..... See p
Fixture (Canopy, Candelabra and Key Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo. f . . . . . .
Anylite Elec. Co., Ft. Wayne, Ind. . . . . L . .
Arrow Electric Company, Hartford, Conn. f sp P R L F
Arrow Head. See Arrow Elec. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . f p P . . . F
Best. See United States Elec. Mfg. Corp.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. . . . . f . . . . . .
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. . . . . L F
Bryant Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. . . . . F
Circle F. Mfg. Co., Trenton, N. J. . . . . f . . P . . L F
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . p P R L F
Crouse-Hinds Co., Syracuse, N. Y. . . . . L . .
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. . . . . P . . . . L . .
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal. . . . . R . . . .
Diamond H. See Hart Mfg. Co.
Dugle. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . F
Gaynor Elec. Co., Bridgeport, Conn. . . . . f . . . . . L . .
General Elec. Co., Bridgeport, Conn. . . . f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. . . . . F
Hart Mfg. Co., Hartford, Conn. . . . . f sp P R L . .
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.) . . . . . f sp P R L F
Hart. See Hart & Hegeman Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Harvey, Inc., Bridgeport, Conn. . . sp . . . . L F
Jost. See Morse, Frank W.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y. . . . . f . . P . . . . . F
Leviton Mfg. Co., 226 Newell, Brooklyn . . . . . F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . . f . . . . . L F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. . . . . L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. . . . . s . . R . . . .
Morse Co., Frank W., 291 Congress, Boston . . . P . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill. . . . . L F
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John I. New Bedford, Mass. . . . f s P . . . . .
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Roberts Elec. Mfg. Co., 2 Centre, New York, N. Y. . . . . F
Rodale Mfg. Co., 200 Hudson, New York p . . . . . F
Sears, Henry D., 80 Boylston, Boston . . f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. . . . . P . . . . .

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WHEN you turn a job of molding over to International you can forget it. No matter how difficult it is, or how much trouble it has been promising to make.

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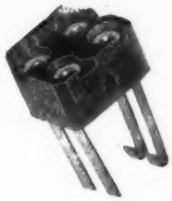

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Great experience, the best of facilities and full-blast operation on a large scale—these are yours with International molding service. Estimates furnished without obligation. May we hear from you?

SOCKETS & RECEPTACLES—Continued

Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. . . . . A
Arrow Elec. Co., Hartford, Conn. . . . . M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. . . . . K . . P . . .
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . C . . . . P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport. . . . . M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. . . . . M . . K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. . . . . .
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. . . A W . . . . . .
Cutler-Hammer Mfg. Co. 1287 St. Paul Ave., Milwaukee, Wis. . . . . K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. . . . . .
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. . . . . C . . . . . .
Federal Electric Co., 8700 S. State, Chicago, Ill. . . . . A
Fluta. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. . . . . M C . . . . . B . .
Gaynor Elec. Co., Bridgeport, Conn. . . . . A
General Elec. Co., Bridgeport, Conn. . . M C K T P B A
Glow Elec. Co., 23 Queens, Long Island City, N. Y. . . . . M . . . . . B . .
Hart & Hegeman Mfg. Co., Hartford, Conn. . . . . M C K T P B A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) . . . . . .
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. . . . . A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. . . . . M C K . . P B A
Leveller. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. . . . . P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) . . . . . A
Meteor Elec. Corp., 499 E. 70th, New York, N. Y. . . . . K . . P . . .
Molded Socket Corp., Railroad, Pa. . . . K . . . . . .
Multi Elec'l Mfg. Co., 210 N. Ogden Ave., Chicago, Ill. . . . . A
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. . . . . M C K T P B A
Paulding, John I., New Bedford, Mass. . . . . B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. . . . . A
Propp Co., M., 524 Broadway, New York, N. Y. . . . . .
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. . . . . M . . . . . P B . .
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y. (Candle.) . . . . . T . . B . .
Rodale Mfg. Co., 200 Hudson, New York, N. Y. . . . . .
Royal. See Sears, Henry D.
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. . . . . .
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. . . . . A
TEC. See Electric Company.
Trumbull Elec. Mfg. Co., Plainville, Conn. . . . . A
Union Insul. Co., Parkersburg, W. Va. . . . . A
United States Elec. Mfg. Corp., 232 W. 14th, New York, N. Y. . . . . P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. . . . . A
Walco. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. . . . . .
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) . . . . . P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. . . . . P . . . .
Wiring Devices, Inc., 5 High, Trenton, N. J. . . . . A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) . . . . . A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.

National Lead Co., 111 Broadway, New York, N. Y.
Soldercil Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING
Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Ameo. See American Solder & Flux Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brunner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Letellier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammonica.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Saltrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Soldercil Co., 129 Sussex Ave., Newark, N. J.
Soldering. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tinli. See Letellier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betzy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper)

Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio. See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 31st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator

(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SOLENOIDS. See Coils.

SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.

SPAGHETTI. See Tubing, Varnished Fabric.

SPEED CHANGING UNITS. See Gears (Speed Changing Units).

SPEED INDICATORS. See Tachometers.

SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS

Airway. See Binks Spray Equip. Co.
Babco. See Simons Paint Spray Brush Co.
Binks Spray Equipment Co., 3120 Carroll Ave., Chicago, Ill.
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Pneumatic Spray Co., 87 130th, Richmond Hill, N.Y.
Ideal Air Brush Mfg. Co., 203 Lafayette, New York, N. Y.
Little Brown Jug, Inc., Reading, Pa.
Metal Specialties Mfg. Co., 338 N. Keeler Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1911 Diversey Parkway, Chicago, Ill.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 1017 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Sprayit. See Electric Sprayit Co.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,

Advance Spring & Wire Co., 1749 Carroll Ave., Chicago.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Farrington & Co., 38 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
American Stamping Co., 978 E. 64th, Cleveland, O.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.

THE NEW FLUX
For Soldering Nickel Chromium Alloys
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THE COLASTA CO.,
Hoosick Falls, N. Y.

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Gouder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See B-H Dog Elec. Products Co.
Niagara Metal Stamping Corp., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Mansfield Sheet & Tin Plate Co., Mansfield, Ohio.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Uniloy. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

Acme Steel Co., 2840 Archer Ave., Chicago, Ill.
Republic Iron & Steel Co., 335 Market, Youngstown, O.

STRIPPERS, Wire

Acme. See A. Laubscher.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Service Sales & Mfg. Co., 3429 W. 126th, Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches, Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Hewatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.

Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1133 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY

Feed Through ..... See p
Fixture (Canopy, Candelabra and Key & Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo. f . . . . . .
Anylite Elec. Co., Ft. Wayne, Ind. . . . . L . .
Arrow Electric Company, Hartford, Conn. f sp P R L F
Arrow Head. See Arrow Elec. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . f p P . . . . F
Best. See United States Elec. Mfg. Corp.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. . . . . f . . . . . .
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. . . . . L F
Bryant Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. . . . . F
Circle F. Mfg. Co., Trenton, N. J. . . . . f . . P . . L F
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . p P R L F
Crouse-Hinds Co., Syracuse, N. Y. . . . . L . .
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. . . . . P . . . . L . .
Diamond Elec. Mfg. Co., 1320 E. 16th, Los Angeles, Cal. . . . . R . . . .
Diamond H. See Hart Mfg. Co.
Dugie. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . F
Gaynor Elec. Co., Bridgeport, Conn. . . . . f . . . . . L . .
General Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. . . . . F
Hart Mfg. Co., Hartford, Conn. . . . . f sp P R L . .
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.) . . . . . f sp P R L F
Hart. See Hart & Hegeman Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Harvey, Inc., Bridgeport, Conn. . . sp . . . . L F
Jost. See Morse, Frank W.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y. . . . . f . . P . . . . .
Leviton Mfg. Co., 226 Newell, Brooklyn . . . . . F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . . f . . . . . L F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. . . . . L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. . . . . s . . R . . . .
Morse Co., Frank W., 291 Congress, Boston . . . P . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill. . . . . L F
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John L., New Redford, Mass. . . . f s P . . . . .
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Roberts Elec. Mfg. Co., 2 Centre, New York, N. Y. . . . . F
Rodale Mfg. Co., 200 Hudson, New York p . . . . . .
Sears, Henry D., 80 Boylston, Boston . . f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. . . . . P . . . . .

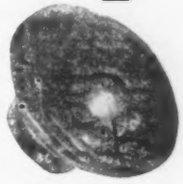
Your Tough Molding Job "Will Toe the Mark"

WHEN you turn a job of molding over to International you can forget it. No matter how difficult it is, or how much trouble it has been promising to make.

Every job in the International production flow has to "toe the same mark," submitting to the same rigorous standards of precision and uniformity, and the same exact meeting of schedules.

Inserts made, assembled, and inserted in the molding process.

Your molds get made *right*. Your inserts—screw-machine and punch-press work, threaded, tapped and polished—are just *right*. Assembling gets done *right* in the molding process. Moldings come out *right*. Every schedule is met on the dot and met right.



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Collar of automobile gas, ignition and lighting lever assembly.

Great experience, the best of facilities and full-blast operation on a large scale—these are yours with International molding service. Estimates furnished without obligation. May we hear from you?

Switches, Snap—Continued
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill..... f s P R L ..
Trigle. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L ..
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y..... f .. ..
Victor. See Keil & Son, Francis.
Weber. See Sears, Henry D.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y..... F
Workrite. See Morse, Frank W.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank

Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilboken Mfg. Co., 404 Grove, Milwaukee, Wis.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Cleveland. See D. J. Time Switch Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
D-J Time Switch Co., 1306 E. 14th, Cleveland, O.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Electric Tachometer Corp., 310 N. 11th, Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brocklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TANK SWITCHES. See Switches, Tank.

TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp. (Elec'l Dept.), New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Webbing Co., Nye, Pawtucket, R. I. (Cotton, Silk.)

Awebco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beledentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Glimer Co., L. H. (Tacony), Philadelphia, Pa.
Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Micanite Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville Corp. (Elec'l Dept.), New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co
Security. See United States Rubber Co.
Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stirwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

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Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., Dept. ER4, 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Fieron & Son, M. M., 113 N. Broad, Trenton, N. J.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. D., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sts., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., G Dept., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ez-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 272 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Oran, David W., 43 Royalstone Ave., Minneapolis, Minn.
Panelitest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 182 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.

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If you have volume articles, tell us what moulds you have and we will tell you what our 24-hour production will produce daily.

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Thermostats—Continued
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Leachwood Co., Janesville, Wis.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sensatherm. See Mercoid Corp.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teegle Co., L. R., 540 E. 9th, Portland, Ore.
Thermosnap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.
TINSEL. See Wire, Insulated.

TIPS, Cord

Alden Mfg. Co., Brockton, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7509 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Saunton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 1638 S. Wabash Ave. Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., 1823 Wyandotte, Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS

Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage

Sorgel Elec. Co., 89 W. Water, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition

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American Bosch Magneto Corp., Springfield, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power

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Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

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TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Beres Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic

Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose & Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Leachwood Co., Janesville, Wis.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insulite Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.
UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator.

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. B, 1217 Washington, Boston.
Allen-Bradley Co., 493 Clinton, Millwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darle Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 28 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elec'l. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hexwound. See Monitor Controller Co.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Serco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag. Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1220 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., R. of Tolman, Boston, Mass. (Water.)
Crane Co., 8. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-33rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.

WASHERS, FIBRE. See Fibre.

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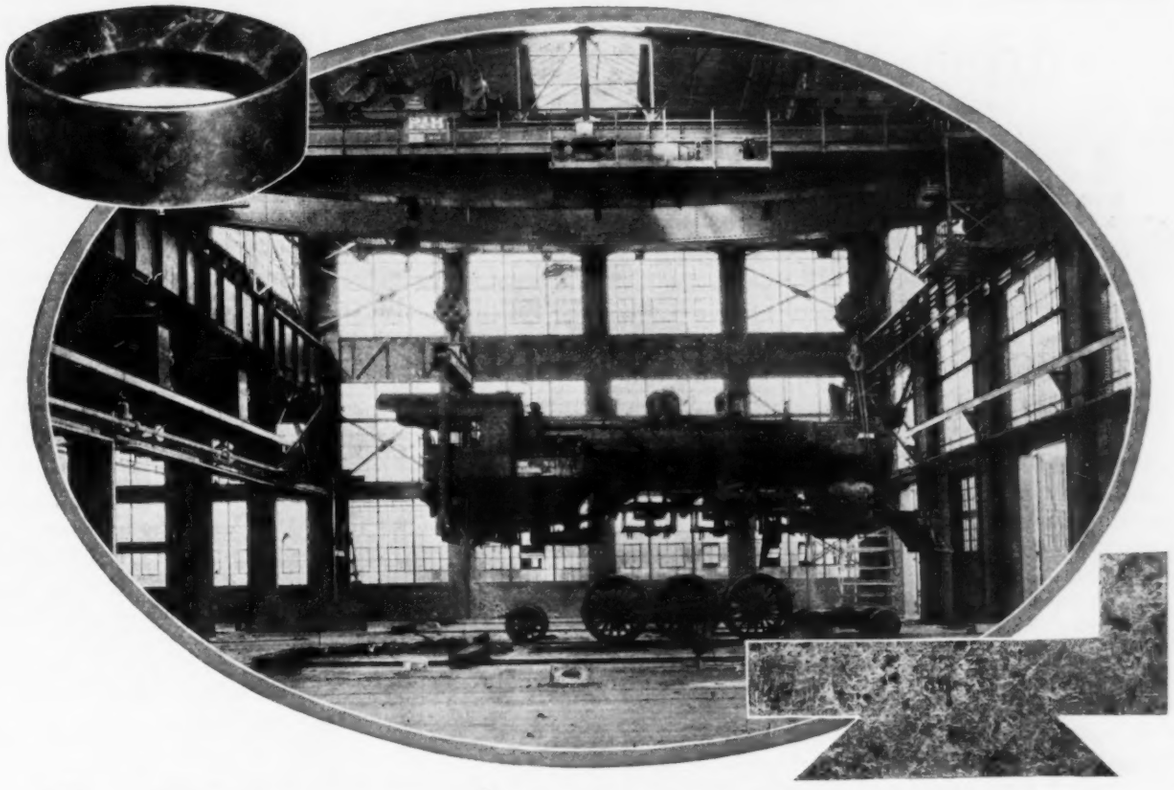
INDUSTRIAL HEATER COMPANY
300 Canal Street New York, N. Y.



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Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.. .. S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S ..
Clifton Mfg. Co., 65 Brookside Ave., Boston.... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J..... W S ..
Dielectric Mfg. Co., St. Louis, Mo..... W .. C
Dolph Co., John C., 168 Emmet, Newark, N. J. W .. ..
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn..... W .. ..
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O..... W S ..
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich..... W .. ..
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York..... W .. ..
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W .. ..
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W .. ..
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... W .. ..
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W .. ..
Sherwin-Williams Co., Cleveland, O..... W .. C
Standard Varnish Wks., 435 4th Av., New York.. W .. ..
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S ..
Star Porcelain Co., Trenton, N. J..... W .. C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W S ..
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. ..... S ..
Williams Co., F. M., 1233 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y..... W .. ..

WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS
Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Ry. Improvement Co., 2070 E. 61st, Cleveland, O
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fusion Welding Corp., 103rd St. & Torrence Ave., Chicago.
Fuzon. See Fusion Welding Corp.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., Fort & Mt. Elliott, Detroit, Mich.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS
Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.

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RIVERSIDE AVENUE, NEWARK, N. J.

Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.

WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1320 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Itadio Production Machinery Co., 212 Centre, New York.
Bidlon Company, Frank, 253 A St., Boston, Mass.
Universal Winding Co., Boston, Mass.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Weehawken Elec. & Mfg. Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory
Athey Co., 6192 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord). Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare
Armature Banding .....See S
Copper Wire .....See C
Iron Wire .....See S
Phosphor Bronze .....See B
Radio Bus Wire .....See C
Resistance Wire .....See R
Steel Wire .....See S
Acme Wire Co., New Haven, Conn..... C .. ..
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa..... C R ..
American Brass Co., 25 Broadway, New York,
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R ..
American Electrical Works (Phillipsdale), Providence, R. I. ..... C .. ..
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C .. S
Anaconda. See American Brass Co.
Ballast. See Gilby Wire Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C .. ..
Belden Mfg. Co., 2310B S. Western Ave., Chicago C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass..... .. R ..
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn..... C .. ..
Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Earris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C .. ..
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa..... C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C .. ..
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C .. ..
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 97 Greene, New York, N. Y... C .. ..
Detroit Insulated Wire Co., Detroit, Mich..... C .. ..
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J..... .. R ..
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.. .. .. ..
Gilby Wire Co., Riverside Ave., Newark, N. J.... .. R ..
Goldmark Co., James, 83 Warren, New York.. C .. ..

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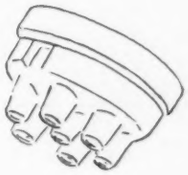

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WIRE, Bare—Continued
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C . . .
Hoskins Mfg. Co., Detroit, Mich. .... R . .
Hudson Wire Co., Ossining, N. Y. ..... C R . .
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C . . S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Inland Wire & Cable Co., Sycamore, Ill. ..... C . . .
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C . . .
Monarch Elec. & Wire Co., 622 W. Adams, Chicago C . . S
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark .. . R . .
Nehring Electrical Works, De Kalb, Ill. ..... C . . .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. .... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. ..... C . . .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C . . .
Race. See Ross Wire Co.
Roebling's Sons Co., John A., Trenton, N. J. ..... C . . S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C . . .
Ross Wire Co., 69 Bath, Providence, R. I. ..... C . . .
Silcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. ..... C . . .
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C . . .
Super-Insulated Wire Co., Plymouth, Mass. ..... C . . .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C . . .

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

Drawing and Re-drawing Mill Equipment for Small Wires.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Con..

WIRE, Insulated

KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord.....See H
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See R
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See R
Lamp Cord .....See R
Magnet Wire .....See M
Rubber Covered Wire & Cable..See R
Stove Wire .....See H
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R . . . . . .
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Enameled Silk, Cotton .... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. ..... A . . M . .
American Copper Products Corp., 233 Broadway, New York, N. Y. ....
American Electrical Works (Philipsdale), Providence, R. I. .... M
American Enameled Magnet Wire Co., Muskegon, Mich. .... M
American Insulated Wire & Cable Co. Div. of General Cable Co., 954 W. 21st, Chicago, Ill. .... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F . . A T . .
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled .... A . . M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R . . . . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F . . . . . .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H . . . . .
Bradford, Kyle & Co., Plymouth, Mass. .... M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H . . . . .
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R . . . . . .
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.

Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 97 Greene, New York, N. Y. ..... R . . . . . .
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T . .
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R . . . . T . .
Diamond Braiding Mills, Chicago Heights R F H . . . . .
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R . . H . . . .
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. . . . . M
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R . . . . . .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. .... F . . . . . .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. .. . . . . T . .
General Asbestos & Rubber Co., Charleston, S. C. .... H . . . . .
General Elec. Co., Bridgeport, Conn.... R F H . . . M
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet .... A . . M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R . . . . . T . .
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y. ..... R . . . . . .
Hatfield Rubber Wks., Inc., Hillside, N. J. R . . H . . . .
Hazard Insulated Wire Works, Div. of Okonite Co., Passaic, N. J..... R F . . A . . .
Hercules Powder Co., Wilmington, Del.. . . . . A . . M
Holyoke Co., 621 Broadway, New York.. R . . . A . . M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H . . . . .
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R . . . . . .
Kilo, Co., 2 E. 23d, New York..... . . . . . T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. .... T . .
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H . . . . .
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. ..... R . . . . . T . .
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled .... M
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T . .
Massachusetts Elec. Mfg. Co., West Lynn, Mass. .... M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill. .... A . . .
Montgomery Co., J. R., Windsor Locks, Conn. .... T . .
National India Rubber. See U. S.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa..... R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass.. R . . H . . T . .
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R . . . . . .
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J. ..... R . . . . . .
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F . . . . . .
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. .... H A T . .
Phillips Wire Co., Pawtucket, R. I..... R . . . . . .
Providence Insulated Wire Co., Providence, R. I. ..... R F H A . . .
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. ..... R . . H . . T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. .... M
Rome Wire Co., Rome, N. Y. ..... R F H . . T M
Ross Wire Co., 69 Bath, Providence, R. I.. R . . . . . .
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. .... T . .
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H . . . . .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R . . . . . .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F . . . . . .
Shield. See Ansonia Elec'l Co.
Spiralweave See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. . . . H . . . . .
Standard Insulated Wire Co., Westfield, Mass. ..... R . . H . . . . .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T . .
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R . . . . . .
Strand & Sweet Mfg. Co., Winsted, Conn. . . . . M
Super-Insulated Wire Co., Plymouth, Mass. . . . . M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.

Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F . . . . . .
United States Rubber Co., 1790 Broadway, New York, N. Y. ..... R . . H A T . .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R . . H . . . M

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines .....See A
Braiding Machines .....See B
Bunching Machines .....See S
Covering Machines .....See I
Insulating Machines .....See I
Insulation Straining Machines.....See I
Measuring Machines .....See M
Park Cabling Machines.....See A
Saturating Tanks .....See F
Spooling Machines .....See U
Stranding Machines .....See S
Tinning Tanks .....See F
Winding Reels .....See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . . S U F
Breguet. See American Insulating Machy.
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. .... M . . U . .
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. .... A . . . . S U
Terkelson Machine Co., 326 A St., Boston, Mass. .... M . . . . .
Textile Machine Works, Reading, Pa. . . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. .... A . . . . U F
Utility Mfg. Co., Cudahy, Wis. ..... I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I. .... B . . . . . .
Watson Mfg. Co., Paterson, N. J. .... M . . . F
Wire Machinery Corp. of Am., New Haven, Conn. .... M S U . .
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

YARN AND THREAD; Silk, Cotton, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville Corp. (Elec'l Dept.), New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co., 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Mattiessen & Hegeles Zinc Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.

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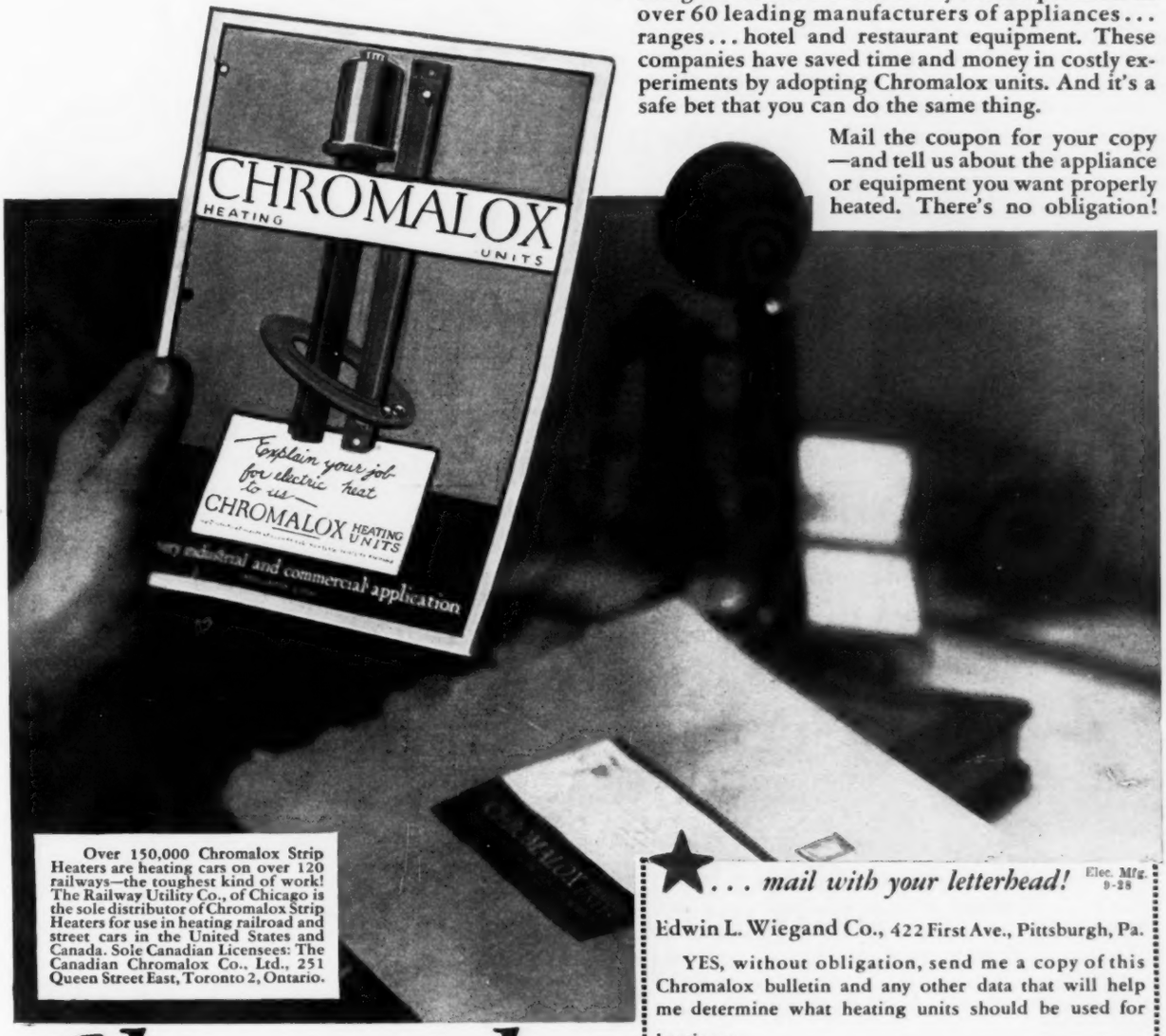
Are you in the midst of designing a new product and are wondering about the heating unit—what's the right size, type and rating? Or are you ironing out the rough spots in an otherwise good electrical appliance, that would be a "best seller" if only the heating unit were what it should be?

Then you'll want a copy of this bulletin. In it are priced and pictured the many sizes of heating units being built into the electrically heated products of over 60 leading manufacturers of appliances... ranges... hotel and restaurant equipment. These companies have saved time and money in costly experiments by adopting Chromalox units. And it's a safe bet that you can do the same thing.

Mail the coupon for your copy —and tell us about the appliance or equipment you want properly heated. There's no obligation!



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Edwin L. Wiegand Co., 422 First Ave., Pittsburgh, Pa.

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HANDY & HARMAN HANDY SOLDERS QUALITY SERVICE

First Hand Studies in the use of "Handy"
SILVER SOLDERS
by Investigator

HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

Multiple Reel for Quantity Production

Another interesting and unusual set up for joining metal parts with silver solder is in operation in the X-Ray tube plant referred to in my story last month.

Fig. 1 shows an 8-spindle revolving spider used for silver-soldering copper-plated sleeves of a nickel steel alloy to the copper shanks of the Anode arms of X-Ray tubes. As the function of these sleeves is to afford a seat for the glass tubes, permanent vacuum-tightness is the major consideration in this joint.

The operator fills the eight spindles of his reel with the shanks, over each of which is slipped one of the nickel-steel sleeves. The loaded reel is slowly revolved through the flame of two oxy-hydrogen torches. When the proper temperature is reached, the operator presses his "Handy" silver solder wire into the red hot cup, using several inches of solder for each joint.

Borax flux is used for this operation. Ordinary commercial borax is heated until it fuses into a glass-like mass. After cooling, it is ground to a fine powder, which is screened to the desired fineness. This purified, de-hydrated borax powder is poured into the inverted cone of the sleeve just before the solder is applied. Each joint is tested individually under water at 150 lbs. air pressure.

Fig. 2 shows the assembly after the welding operation is completed.

Fig. 3 is the same part in place. Connections of this kind are required for all types of X-Ray tubes made by this company.

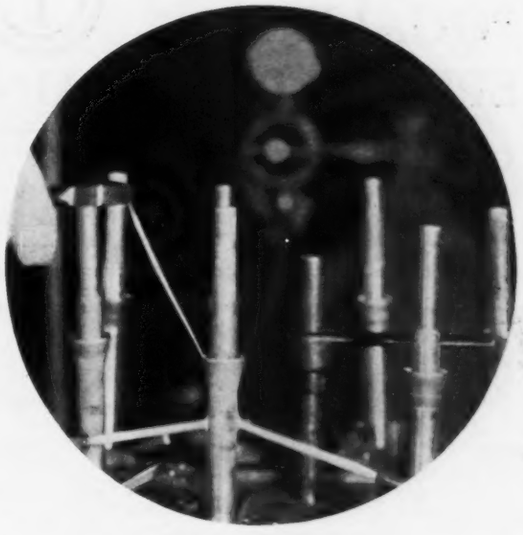

Fig. 1—Multiple Reel

Fig. 3—Welded Part in Place

The reel method is devised to insure the highest possible degree of uniformity in the character of work done, as well as to provide for a relatively large daily output.

I was told by the engineer in charge that "Handy" silver solder has played an important part in the permanent vacuum-tightness of the company's X-Ray tubes.

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Executive Offices—

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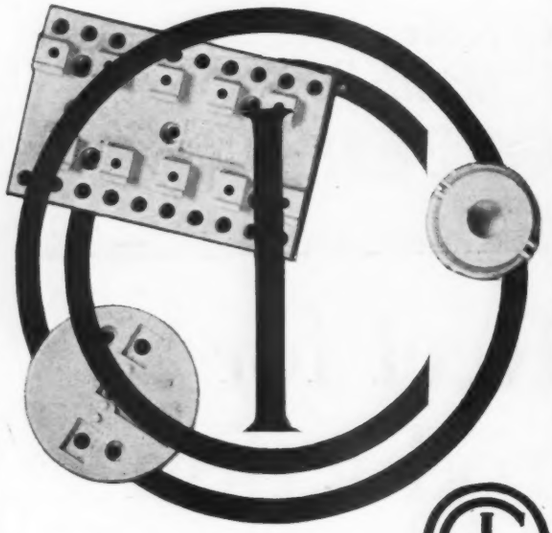
Fig. 2—Finished Weld



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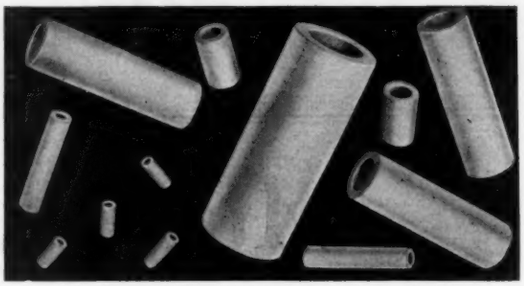

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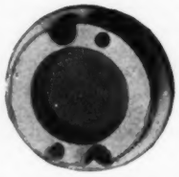

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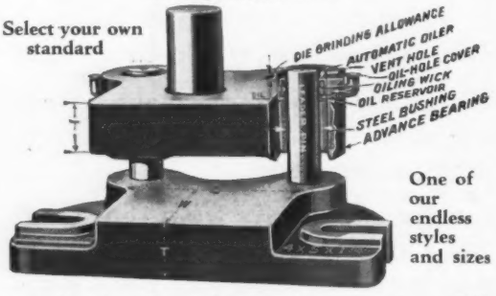

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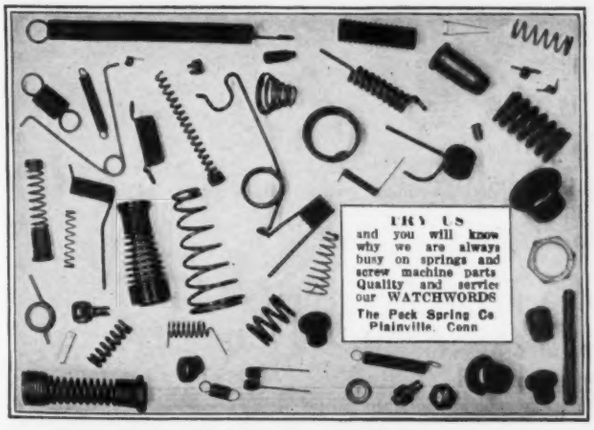
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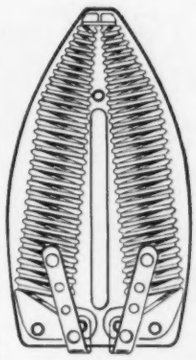

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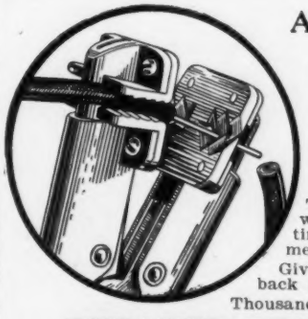

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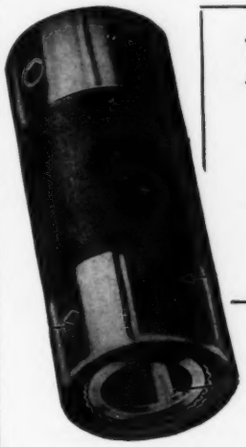

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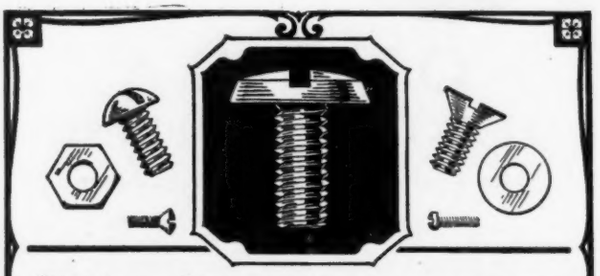

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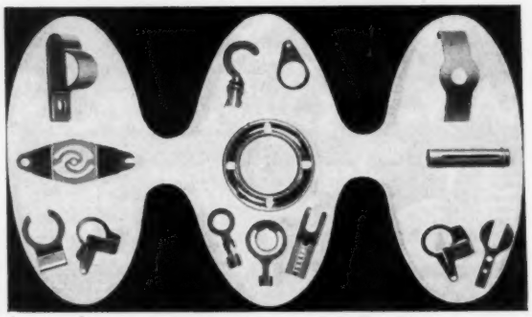

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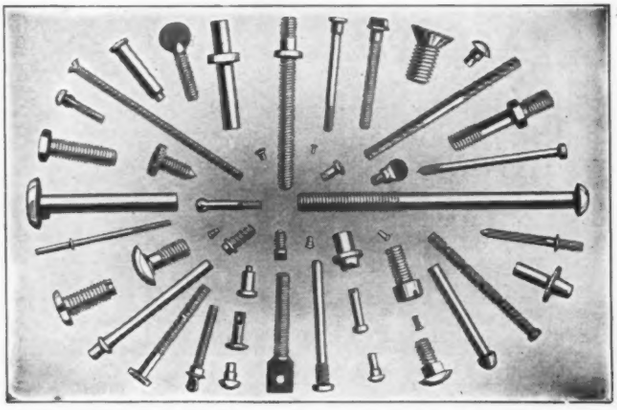

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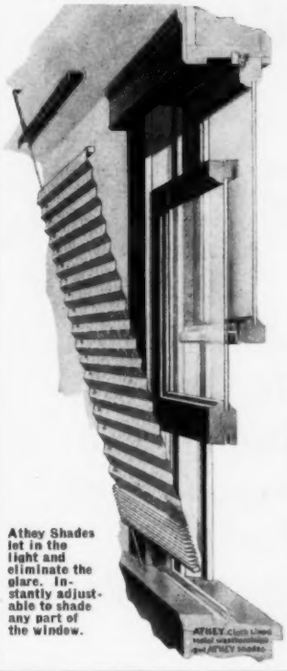
Are you asking the employees

to sit in a cold, drafty room to work where you would not wish to work yourself?

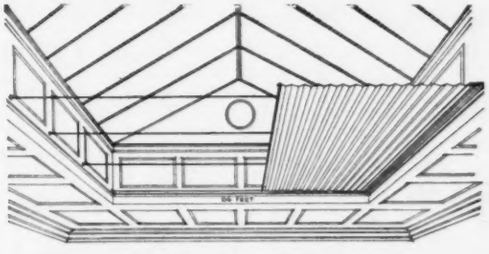


Athey Shades let in the light and eliminate the glare. Instantly adjustable to shade any part of the window.

Athey cloth-to-metal contact. Weatherstrips change any wood or steel window from a rattling, loose, drafty sash to one that works smoothly and quietly and is absolutely draft-proof when closed.

Leaky windows not only cause discomfort to the employees, but necessarily waste fuel because of a forced heating plant. ATHEY Cloth-Lined Metal Weatherstrips pay for themselves in less than three years by saving fuel, not including the saving through cleanliness or ash and fuel handling.

A modern building in Chicago saved 572½ tons of coal in five months at a value of $3,400.00 The Athey installation only cost $4,900.00.



The only skylight shade which disappears entirely, giving full volume of light on cloudy days and a translucent light under the sun's rays. Made in any size up to 16 ft. x 30 ft.

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6192 West 65th St., CHICAGO

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26 of the most modern recent skyscrapers in Detroit are equipped with Athey Shades.

Athey

Cloth-Lined Metal Weatherstrips and Athey Window Shades

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AS we recently said in an advertisement with the heading "What Price Lacquer"—quality comes first in Zellac—then price—and though we will never sacrifice one for the other, when both are right the purchaser gets his money's worth.

We're glad to see this point intelligently developed by an experienced lacquer purchaser, in an article that he wrote under the same heading, recently published by a leading magazine. *The initial price,* says this writer, *is not the main consideration, but* WHAT THE LACQUER WILL DO!

Zellac Lacquer products invariably prove the point! Let us deliver you a trial order specially formulated to meet your requirements—then *test* Zellac for quality as well as economy. It will be an experience both revealing and profitable to you.

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Information Wanted!

We have been asked for the names and addresses of manufacturers of the items listed below:

"Splendida" Electric Iron
"Sal Co. 176" Lamps
"Electron" Heating Pad
"Blaisdell" Automatic Electric Cigar Lighter
"Patrician" Line of Lighting Fixtures
"L. R. Co." Receptacles
"Lily Wilson" Vacuum Cleaner
"Packard" Vacuum Cleaner
"Perkins" Siren
"Wharton" Battery Charger
"Flint" Waffle Iron

Address of Dura Electric Appliances (Manufacturers of Curling Irons)

Replies from our readers to any of these inquiries will be greatly appreciated by

Electrical Manufacturing,
Printing Crafts Bldg., 461 Eighth Ave., New York, N. Y.

20,000

will be the distribution of the

October

issue of

Electrical Record

among *all* the groups who function in the sale and installation of the finished electrical products you make - - -

Central Stations, Jobbers, Contractors, Dealers and Dealer-Contractors

THE GAGE PUBLISHING CO., Inc.

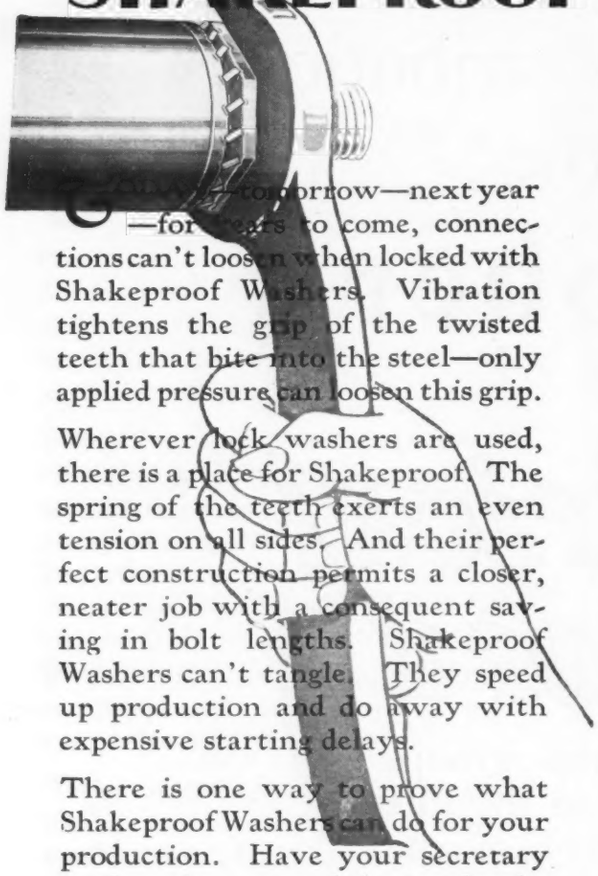
461 Eighth Ave., New York, N. Y.

Publishers of

Electrical Record
Electrical Manufacturing
Metropolitan Electrical News
Gage List of Electrical Buyers

ELECTRICAL RECORD for October has been the Annual Christmas Goods Buying Number for more than twenty-one years!

STAY LOCKED WITH SHAKEPROOF



Today—tomorrow—next year—for years to come, connections can't loosen when locked with Shakeproof Washers. Vibration tightens the grip of the twisted teeth that bite into the steel—only applied pressure can loosen this grip.

Wherever lock washers are used, there is a place for Shakeproof. The spring of the teeth exerts an even tension on all sides. And their perfect construction permits a closer, neater job with a consequent saving in bolt lengths. Shakeproof Washers can't tangle. They speed up production and do away with expensive starting delays.

There is one way to prove what Shakeproof Washers can do for your production. Have your secretary mail us the coupon below and make the test for yourself.

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2513 N. Keeler Avenue **Chicago, Illinois**

Type 11 External | Type 15 Countersunk | Type 12 Internal

Free Shop Test Samples

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Please send me samples of

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Firm Name_____

Address _____ Town_____

State _____ By_____

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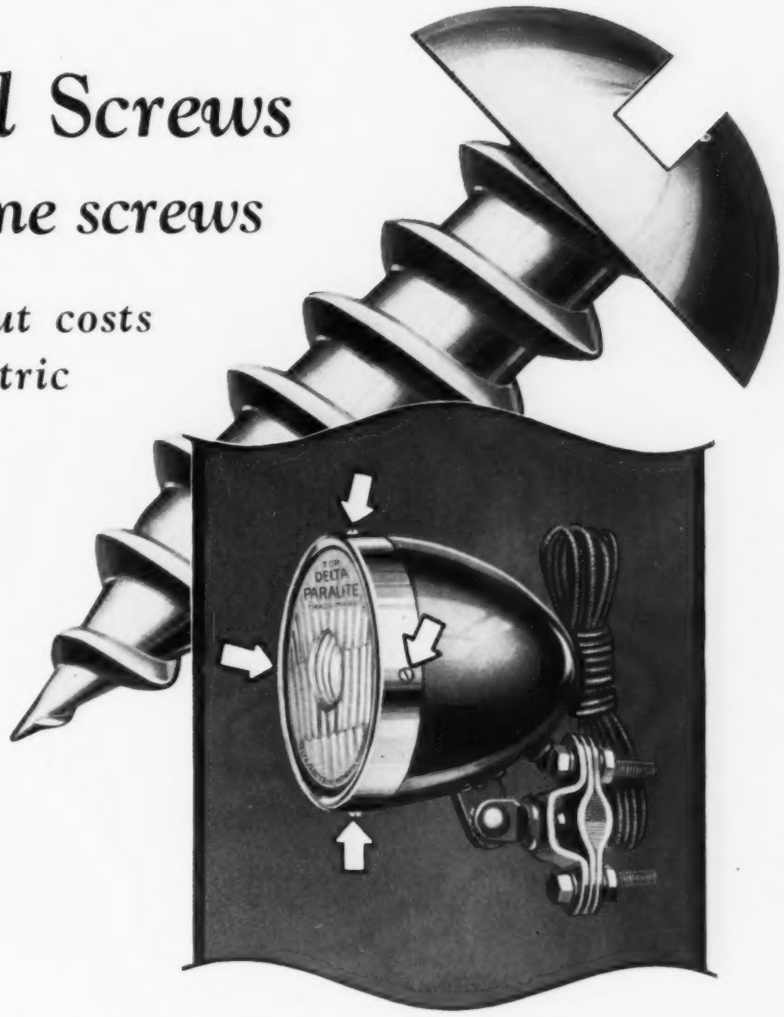
Sheet Metal Screws
replace machine screws
—and materially cut costs for Delta Electric

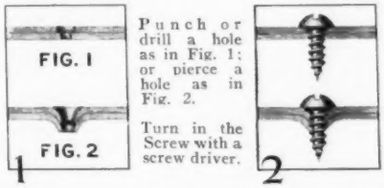


LET the Delta Electric Company tell you how they save through the use of Parker-Kalon Self-tapping Sheet Metal Screws in the assembly of their Bullet Paralite:

"We use these screws for attaching the lens retainer to this shell and have found them quite successful. Formerly we embossed the screw hole and the shell, tapped this embossed hole, and used ordinary machine screws. The use of Parker-Kalon screws has materially decreased the cost of this operation, reduced loss due to defects and proven more satisfactory."

This is the way they work

Only two simple operations are required to join sheet metal or to make a fastening to sheet metal with these unique screws.



Punch or drill a hole as in Fig. 1; or pierce a hole as in Fig. 2.

Turn in the Screw with a screw driver.

As the Screw is turned in, it cuts its own thread in the metal, like a tap. The assembled sections are bound firmly together and the result is a secure fastening—one that stands up even under continuous vibration.

This is how they save

By cutting their own thread, Sheet Metal Screws eliminate the costly tapping operation with its breakage of taps and heavy investment in tapping machinery. Used in place of rivets, bolts, etc., they also effect appreciable savings because they are so much easier to use.

These firms are typical users

Leading manufacturers of electrical products everywhere use these remarkable Screws. General Electric Co., Crosley Radio Corp., Victor Talking Machine Co., Electric Vacuum Cleaner Co., Chas. Freshman Co., and Westinghouse Electric & Mfg. Co., are but a few of many who benefit from their time and labor saving advantages.

Get samples for test—free

Mail the coupon. It will bring you samples for test on your assemblies. Just tell us what you want to fasten and we will send the correct type and size for the job.

PARKER-KALON
HARDENED SELF-TAPPING
Sheet Metal Screws

PATENTED
APR. 1, 1919 - No. 1299232 — MAR. 28, 1922 - No. 1411184
AUG. 14, 1923 - No. 1465148 — FEB. 10, 1925 - No. 1526182
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Name .....

Address .....

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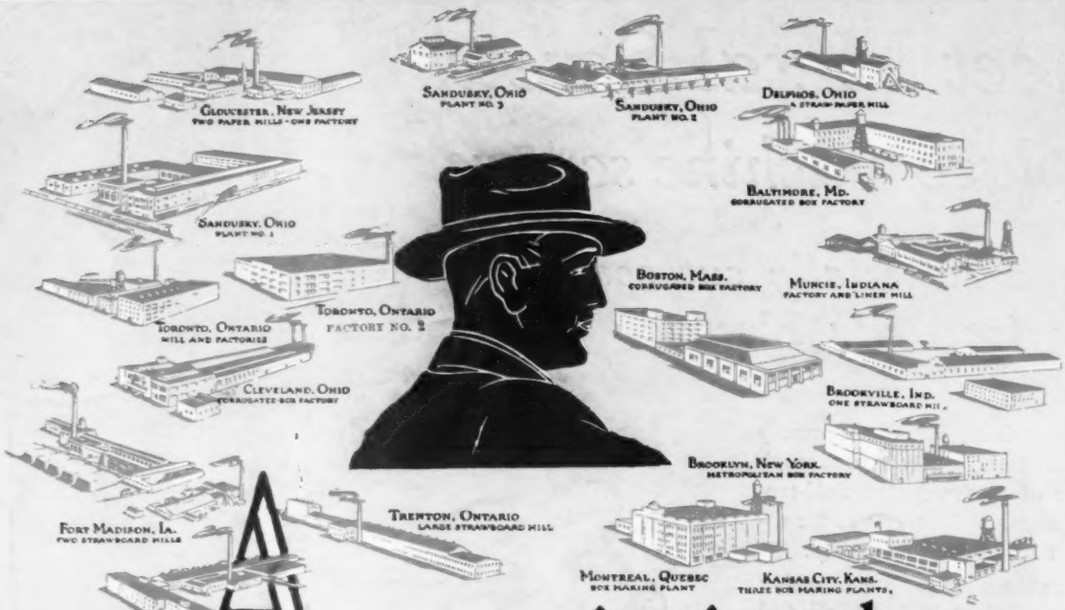

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